Biota Environmental Sciences

Mimbi Extension Camping Grounds Rare Flora Survey

Prepared for Tourism WA

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Mimbi Extension Camping Grounds – Rare Flora Survey

Contents

Tables

Figures

Plates

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1.0 Summary

Tourism WA is investigating the development of a number of commercial camping grounds on Aboriginal lands in the Kimberley. Some of these proposed sites are located near the Mimbi community, approximately 78 km southeast of Fitzroy Crossing.

Four camping ground options have been nominated:

1. camping ground 1: approximately 1.5 km west of the Mimbi community.
2. camping ground 2: approximately 1.2 km north-northwest of the Mimbi community.
3. camping ground 3: approximately 300 m east of the Mimbi community.
4. camping ground 4: approximately 900 m north-northeast of the Mimbi community.

Each camping ground is located within a larger survey polygon:

- Camping grounds 1 and 2 are located within the largest polygon (102 ha), which is notionally labelled 'Mimbi Northwest'. Water bores, associated pipelines and an access road linking camping grounds 1 and 2 will be constructed within this polygon.

  In addition, a proposed access road linking Camping ground 1 to the Mt Pierre Station access road will be located within a 9 ha survey polygon, notionally labelled the Mimbi Corridor.
- Camping ground 3 is located within a 4.3 ha survey polygon, notionally labelled 'Mimbi East'.
- Camping ground 4 is located within a 17 ha survey polygon, notionally labelled 'Mimbi Northeast'.

Biota Environmental Sciences (Biota) was commissioned to undertake a botanical survey within the above survey polygons, hereafter referred to collectively as the 'study area'. The aims of the study were to:

1. identify any flora species of conservation significance on the site that could be threatened by the development;
2. map the extent of weed infestations; and
3. formally record any Aboriginal or non-Indigenous heritage sites observed incidentally.

The field survey was conducted from 10-13 March 2015 by Tim Willing (experienced Kimberley biologist) and Michi Maier (Biota's principal botanist). Representative traverses were walked on foot through all habitats in the study area, and the main landforms and vegetation types were described. The locations of flora of conservation significance and weeds were recorded, along with an estimate of the number of individuals or density. A list of all other flora encountered was also completed, with voucher specimens collected as necessary.

The following vegetation types were described from the study area:

1. *Corymbia opaca* scattered low trees over *Triodia wiseana* hummock grasslands dominating broad pediment slopes of the study area;
2. *Gyrocarpus americanus* scattered low trees over *Triodia wiseana* hummock grasslands on rocky areas and a small limestone hill in Mimbi Northwest and Mimbi Northeast;
3. *Melaleuca lasiandra, Acacia ampliceps* scattered shrubs over *Triodia wiseana* hummock grasslands in a somewhat swampy area in Mimbi Northwest;
4. *Triodia inaequiloba* hummock grasslands on lateritised limestone rises in Mimbi Northwest;
5. *Acacia synchronicia, A. ampliceps* scattered tall shrubs over *Xerochloa laniflora* tussock grasslands on possible saline areas in Mimbi Northwest;
6. *Bauhinia cunninghamii* scattered low trees over *Dichanthium fecundum* tussock grasslands on heavier clay soils throughout the study area;

7. Riparian vegetation comprising mixed woodlands of *Lophostemon grandiflorus* subsp. *riparius*, *Terminalia platyphylla*, *Bauhinia cunninghamii*, *Corymbia opaca* and/or *Eucalyptus tectifica* over tussock grasslands along Mimbi Creek and Pinnacle Creek in Mimbi Northwest, Mimbi East and the Mimbi Corridor; and
8. Riparian vegetation comprising *Lophostemon grandiflorus* subsp. *riparius* woodland over *Terminalia platyphylla* low woodland over mixed open sedgelands, principally at a small permanent spring on Pinnacle Creek in Mimbi Northwest.

A total of 16 introduced flora species (weeds) were recorded. One of these (Calotrope, **Calotropis procera*) is a declared pest under the *Biosecurity and Agriculture Management Act 2007;* one plant was recorded in Mimbi Northeast, and another was recorded just outside of that polygon. The introduced flora species **Aerva javanica* (Kapok Bush), **Cenchrus ciliaris* (Buffel Grass), **C. setiger* (Birdwood Grass) and **Stylosanthes hamata* (Verano Stylo) can all be serious environmental weeds.

The main disturbance in the study area comprised some infestations of **Aerva javanica* and **Cenchrus* species in the western section of the Mimbi Corridor, and along the verge of the Mt Pierre Station access road at the edges of Mimbi Northwest and Mimbi Northeast. Grazing and trampling by horses was also noted, particularly along the minor drainage lines. There were few signs of human disturbance, apart from several vehicle tracks, and a dump of cars and some large rubbish items in the southwest of Mimbi Northwest. The study area had a variable fire history: some sections had been relatively recently burnt (within the last 2 years), while other parts appeared to be long unburnt.

A total of 206 native flora taxa from 126 genera in 55 families were recorded from the study area, most of which are relatively typical of the locality.

No Threatened flora species were recorded from the study area and none would be expected to occur. No Priority flora were recorded from the Mimbi Corridor, but four species were recorded from the remaining areas:

- *Ipomoea racemigera* (Priority 2) was found in Mimbi Creek, along the southern boundary of Mimbi East. There should be no reason to clear within this creekline, hence no impacts on this species would be expected.
- Two species were recorded only from Mimbi Northwest: *Triodia pascoeana* (Priority 1) was recorded from a section of Pinnacle Creek in the northeast, while *Fimbristylis sieberiana* (Priority 3) was recorded only from the spring area on Pinnacle Creek. The water pool at the spring would be of local significance, given that it appears to be the only permanent water source in the study area, and some conservation significant fauna have been recorded at this location (Biota 2015). These locations could be directly impacted by clearing of the proposed access road linking camping grounds 1 and 2 and/or the proposed pipeline linking camping ground 2 to its water bore. Development of the access road linking camping grounds 1 and 2 also has the potential to impact drainage through Pinnacle Creek, which could cause indirect impacts to the Priority flora populations.
- *Pterocaulon xenicum* (Priority 3) was recorded from all three of the proposed camping ground polygons: Mimbi Northwest, Mimbi Northeast and Mimbi East. This species appears to be locally common, and given its broad range (from the eastern Pilbara to the Northern Territory), it is likely that this species has been poorly collected rather than being genuinely rare. Given the common and widespread nature of this species in the locality, management would be limited to minimising clearing within the study area.

The following management recommendations are proposed to minimise impacts to the study area:

1. Rather than wholesale clearing of the camping ground polygons, individual camping bays should be developed around the limestone ridge features.
2. The routes of the access road linking camping grounds 1 and 2, and the proposed pipeline linking camping ground 2 to its water bore, should be selected such that they do not impact the permanent spring (which includes the population of the Priority 3 *Fimbristylis sieberiana*) or the location of the Priority 1 *Triodia pascoeana*.
3. Crossovers on the channels of Pinnacle Creek in Mimbi Northwest should be constructed so as to avoid any change to surface water flow in this drainage system.
4. Clearing should be kept to a minimum to minimise disturbance to the Priority 3 species *Pterocaulon xenicum*.
5. Control of the declared pest **Calotropis procera* (Calotrope, or Rubber Bush) at Mimbi East should be considered. Control of **Stylosanthes hamata* (Verano Stylo) would also be desirable to improve the amenity of the study area for camping, however this invasive species may be difficult to manage.
6. Clearing in the Mimbi Corridor should be conducted from east to west, to minimise the transfer of weed propagules from the species that are relatively abundant in the western half of the corridor (particularly **Aerva javanica* and **Cenchrus* spp.). Earth-moving equipment should be washed down after use in weed-infested areas, particularly the western half of the Mimbi Corridor and the verges of the Mt Pierre Station access road near Mimbi Northwest and Mimbi Northeast.
7. Consideration should be given to removal of any *Grevillea pyramidalis* and **Passiflora foetida* var. *hispida* plants in close proximity to the final camping ground/s due to their potential to cause harm.
8. Signs or brochures may be useful to provide information to visitors regarding the values of the camping grounds, particularly the presence of Priority flora species and bush food plants, and issues such as weeds and toxic plants.

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2.0 Introduction

2.1 Background to the Project

As part of a project entitled 'Camping with Custodians', Tourism WA is investigating the development of a number of commercial camping grounds on Aboriginal lands in the Kimberley. Some of these proposed sites are located at Mimbi (hereafter referred to as the 'study area'), approximately 78 km southeast of Fitzroy Crossing along the Great Northern Highway (Figure 2.1).

Two camping grounds were previously nominated at Mimbi: CLA2 (northwest of the intersection of the Mimbi community road with the Mt Pierre Station road) and CP1 (southeast of the same intersection), and botanical surveys were completed for these areas (Biota 2014a, and 2014b respectively). However, both CLA2 and CP1 were subsequently rejected for development approval by the community.

Four new options for the location of camping grounds are currently proposed for the broad valley between the Emanuel and Lawford Ranges (see Figure 2.1). These are:

1. camping ground 1: approximately 1.5 km west of the Mimbi community, at the base of the Emanuel Range;
2. camping ground 2: approximately 1.2 km north-northwest of the Mimbi community, just west of the Mt Pierre Station road;
3. camping ground 3: approximately 300 m east of the Mimbi community, in the area southwest of the intersection of the Mimbi community road with the Mt Pierre Station road. This site was identified by Rosemary Nuggett (traditional owner) in March 2015 while on site with Gary Taylor (Tourism WA); and
4. camping ground 4: approximately 900 m north-northeast of the Mimbi community, at the base of the Lawford Range. This is the least preferred option, as it is located within an area previously nominated by the Department of Parks and Wildlife for inclusion in a regional park.

Each camping ground is located within a larger survey polygon (see Figure 2.1). Camping grounds 1 and 2 are located within the largest polygon (102 ha in size), which stretches between the Mt Pierre Station access road and the Emanuel Range and is notionally labelled 'Mimbi Northwest'. Camping ground 3 is located within a survey polygon 4.3 ha in size, notionally labelled 'Mimbi East'. Camping ground 4 is located within a survey polygon 17 ha in size, notionally labelled 'Mimbi Northeast'.

There is an existing water bore within Mimbi Northeast, which would service camping ground 4, and the location of camping ground 3 is in close proximity to the Mimbi community water tank. Some additional infrastructure would need to be developed to service the proposed camping grounds 1 and 2:

- Two new water supply bores would need to be drilled in Mimbi Northwest (close to the base of the Emanuel Range) to service camping grounds 1 and 2, and associated water pipelines would need to be constructed.
- An access road linking camping grounds 1 and 2 would be required; this would be encompassed within the Mimbi Northwest survey polygon.
- An additional proposed access road to service camping ground 1, linking in with the existing borefield road, is also proposed along the southern boundary of the Mimbi community lease. This would be developed within the 9 ha polygon that is notionally labelled 'Mimbi Corridor' (Figure 2.1).

Clearing of native vegetation on the site will be required in order to establish the camping areas and associated infrastructure. It is likely that the environmental impact assessment (EIA) of this clearing will be undertaken under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

2.2 Scope of the Study

Biota Environmental Sciences (Biota) was commissioned to undertake a rare flora survey of the study area to support the EIA process. The principal aims of the study, as identified by Tourism WA, were to:

1. identify any flora species of conservation significance (see Appendix 1) on the site that could be threatened by the development;
2. map the extent of weed infestations; and
3. formally record any Aboriginal or non-Indigenous heritage sites observed incidentally.

These aims were met by conducting a desktop review of information available for the locality (see Section 3.1), followed by a four-day field survey in March 2015 by two botanists (Section 3.2).

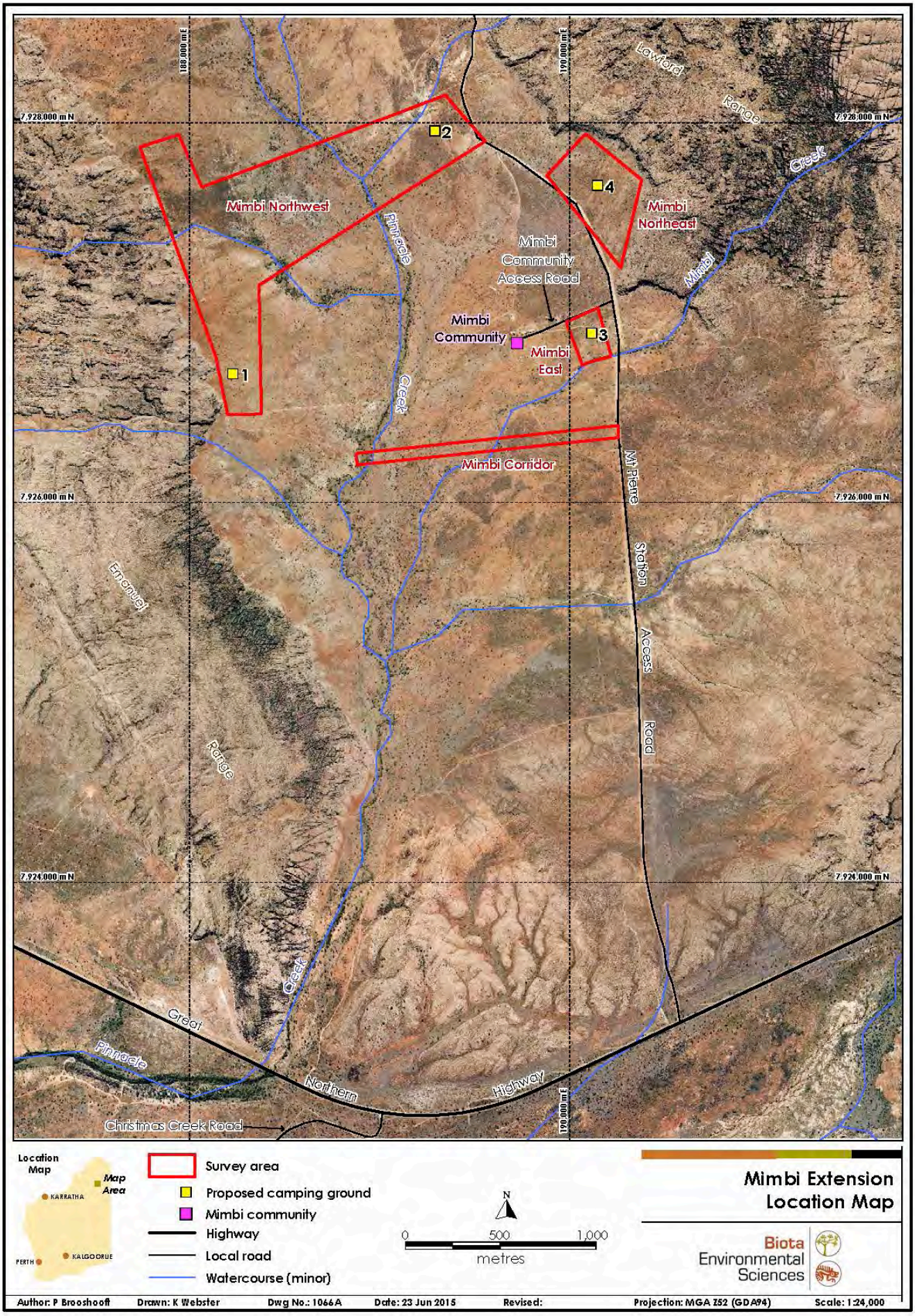

Figure 2.1: Location of the Mimbi Extension study area.

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3.0 Methodology

3.1 Desktop Review

The WA Department of Parks and Wildlife[1] maintains lists of Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) for each region of the state (Department of Parks and Wildlife 2014a, and 2014b respectively). Appendix 1 provides more detail regarding these categories. TECs and PECs described for the Kimberley region were reviewed to identify any communities that may be relevant to the study area.

The NatureMap database (Department of Parks and Wildlife and WAM 2015) is a joint project of the Department of Parks and Wildlife and the WA Museum, and is the most comprehensive source of information on the distribution of WA's flora and fauna. From a flora perspective, it comprises records from the WA Threatened and Priority Flora Database and the WA Herbarium specimen database (both managed by the Department of Parks and Wildlife). NatureMap was searched for flora species of conservation significance recorded within a radius of 40 km (the maximum distance permitted) from a point central to the study area components (18° 43' 30" S, 126° 03' 13" E). Further information is provided in Appendix 1 regarding the categories of flora of conservation significance.

Other regional-scale datasets and reports were reviewed, including bioregional information (Graham 2003a), land systems mapping (Payne and Schoknecht 2011) and vegetation mapping (Beard 1979). The two previous botanical survey reports from CLA2 (Biota 2014a) and CP1 (Biota 2014b) were also considered.

Data from all of the above sources are discussed where relevant in this report.

3.2 Field Survey

3.2.1 Survey Team and Methodology

The field survey was conducted by two botanists: Tim Willing has extensive experience (over 30 years) in conducting biological surveys in the Kimberley region, and was assisted by Michi Maier (Biota's principal botanist, who has completed several surveys in the Kimberley).

The survey botanists walked parallel traverses at spacings of between 30-100 m through all of the components of the study area. During the foot traverses, searches were conducted for rare flora and weeds, with additional search effort spent in areas likely to support significant species (e.g. rocky areas and creeks). In addition, detailed descriptions of the landforms and vegetation types ("mapping notes") were recorded at regular intervals. Vegetation types were described and their condition was ranked as per the frameworks provided in Appendix 2. The locations of the foot traverses and mapping notes are shown in Appendix 3 to provide an indication of the survey effort.

3.2.2 Survey Timing and Climatic Conditions

The field survey was conducted between the 10th and 13th of March 2015, with travel undertaken outside this period.

Seasonal timing and the amount of rainfall received prior to a survey can have a strong influence over the species recorded during a field survey. The timing was appropriate for a Kimberley survey, following the wet season for the region. Figure 3.1 shows monthly rainfall data for the year preceding the survey. These data were recorded at the closest Bureau of Meteorology (BOM) weather recording station, located 44 km north at Mt Krauss (weather station #2043). Long-term median rainfall values are presented for the same months for comparison. These data were

1 Formerly the Department of Environment and Conservation (DEC).

obtained from the Gogo Station (weather station #3014), which has been operational for a much longer period (since 1908). This station is located 69 km northwest of the study area.

The field survey was conducted approximately six weeks after substantial rainfall in the locality, with the total rainfall in January 2015 more than twice the long-term median for this month. Numerous annual species were recorded and the survey timing was considered optimal for the collection of ephemeral and cryptic perennial flora.

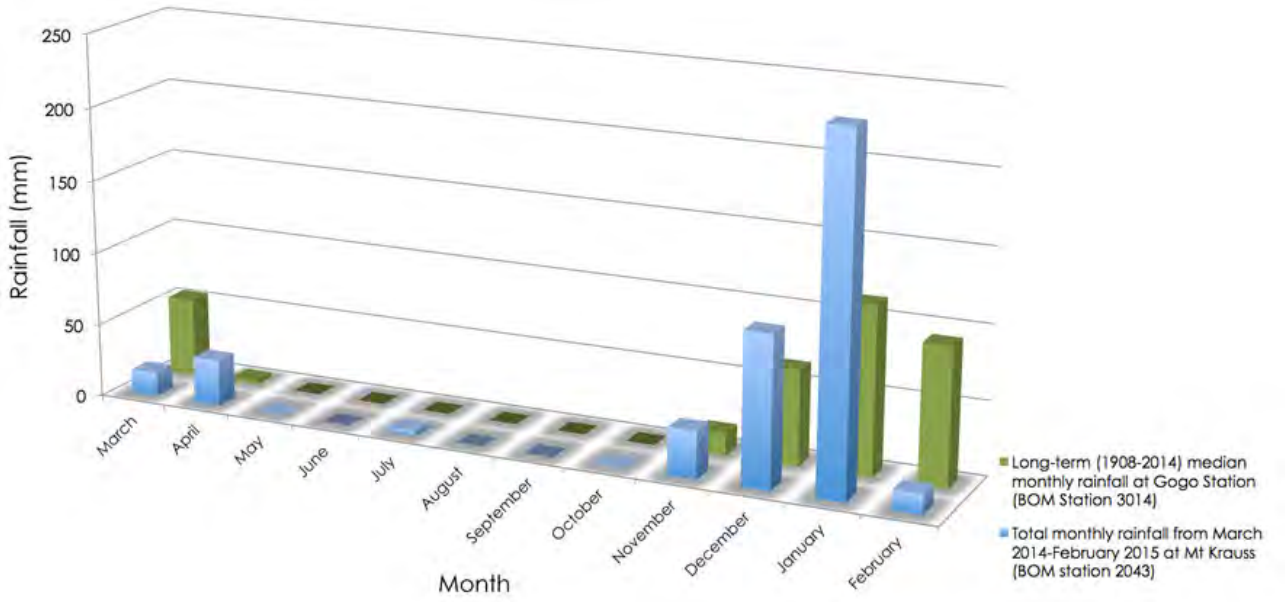

Figure 3.1: Total monthly rainfall at Mt Krauss for the 12 months preceding the survey, compared to the long-term median monthly rainfall as measured at Gogo Station. (Data supplied by Bureau of Meteorology).

3.3 Specimen Identification, Nomenclature and Data Management

Plant specimens were freighted to Perth for further identification using published and unpublished botanical keys and the resources available at the WA Herbarium. Most specimens were identified by Michi Maier, with assistance from Pierre de Kock and Dr Shadila Venkatasamy (all from Biota). A number of specimens were submitted to Dr Matthew Barrett (Kimberley flora specialist) for confirmation or further consideration, and Steve Dillon (Senior Technical Officer / ID Botanist at the WA Herbarium) provided advice regarding two *Euphorbia* specimens.

Data were entered into a Microsoft Access database structure held by Biota. Nomenclature and conservation significance rankings follow those currently recognised by the WA Herbarium, as published on the FloraBase website (http://florabase.dpaw.wa.gov.au). Voucher specimens have been submitted to the WA Herbarium for all relevant taxa (i.e. conservation significant species, atypical taxa and substantial range extensions), provided the material is in suitable condition. Threatened and Priority Flora Report Forms have been submitted to the Department of Parks and Wildlife for all conservation significant species.

Kylie Webster (Graduate GIS Cartographer with Biota) prepared all maps for this report using MapInfo.

3.4 Limitations of the Study

This study provides a good representation of the vegetation and flora of the Mimbi Extension study area, however the following limitations should be recognised:

- While representative traverses were walked through all habitats, some sections of the large Mimbi Northwest area were not systematically searched for rare flora (see Appendix 3 for survey effort).
- Some specimens could not be conclusively determined due to the lack of a full taxonomic framework (see Section 5.2.3).
- The genus *Polymeria* requires revision, as the current taxonomic framework does not adequately address the observed variation. The name *Polymeria lanata* has been used in the broad sense (sens. lat.) only.

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4.0 Background to the Study Area

4.1 IBRA Bioregion and Subregion

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into 89 geographically distinct bioregions on the basis of common climate, geology, landform, native vegetation and species information (DSEWPaC 2012). The study area is located in the western section of the South Kimberley Interzone subregion (OVP2), in the southwestern section of the Ord Victoria Plains bioregion (DSEWPaC 2012).

A biodiversity audit of Western Australia's subregions was completed by the then Department of Conservation and Land Management in 2002 (May and McKenzie 2003). The South Kimberley Interzone subregion was described by Graham (2003a) as "level to gently undulating plains with scattered hills on Cambrian volcanics and Proterozoic sedimentary rocks, with vertosols on plains and predominantly skeletal soils on hills". The overall vegetation is grassland, typically comprising scattered bloodwoods (*Corymbia* spp.) and Snappy Gum (*Eucalyptus brevifolia*) over spinifex (*Triodia* spp.) and annual grasses. The climate is dry hot tropical; semi-arid with summer rainfall. The subregional area extends over 3,540,414 ha.

Some features in the vicinity of Mimbi were described in Graham (2003b) under the Fitzroy Trough subregion (DP1) of the Dampierland bioregion. These included the extensive cave system in the Lawford Range (Mimbi Caves), which was described as a wetland of subregional significance (Graham 2003b).

4.2 Reserves in the Locality

The Mimbi community is central to the four proposed camping ground areas and the proposed access road to camping ground 1. The community is located within a File Notation Area excision from Mt Pierre Station, which is an indigenous-held pastoral lease.

No gazetted reserves associated with nature conservation are located in close proximity to the study area but there are a number in the broader locality. The closest of these are:

- Geikie Gorge National Park (a Class A reserve) and the adjoining Geikie Gorge Conservation Park (Class C), located approximately 77 km northwest of the study area;
- Brooking Gorge Conservation Park (Class C), located 94 northwest of the study area; and
- Devonian Reef Conservation Park (Class C), located 130 km northwest of the study area.

The limestone ranges to the east of Mimbi (principally the Lawford Range) were previously under consideration by the Department of Parks and Wildlife for inclusion in a regional reserve, however this proposal was not formally progressed. The proposed camping ground 4 would fall within this area, should the reserve be enacted in future.

4.3 Land Systems

Land systems mapping for the locality has been prepared by Payne and Schoknecht (2011). The various components of the study area intersect two land systems, Neillabublica and Windjana, as summarised in Table 4.1. The Neillabublica land system dominates all of the areas, while the Windjana land system is associated with the Emanuel and Lawford Ranges along the westernmost and easternmost edges of Mimbi Northwest and Mimbi Northeast respectively.

Table 4.1: Land systems intersected by the study area.

Area of Land System within South Kimberley Interzone Subregion	Neillabublica	Windjana
	72,100.8 ha	30,090.8 ha
Component of Study Area:	Area of Land System in Study Area (% of Total in Subregion)	
Mimbi Northwest	98.4 ha (0.14%)	3.8 ha (0.01%)
Mimbi East	4.3 ha (<0.01%)	–
Mimbi Northeast	14.9 ha (0.02%)	2.4 ha (<0.01%)
Mimbi Corridor	8.5 ha (0.01%)	–

4.3.1 Neillabublica Land System

The Neillabublica land system covers a total of 2,494 km² in the eastern Dampierland bioregion and western Ord Victoria Plains bioregion, towards where these bioregions adjoin the Central Kimberley bioregion (Payne and Schoknecht 2011). It is summarised by Payne and Schoknecht (2011) as:

> "Undulating limestone country with scattered low hills and cracking clay plains. Open grassy woodlands, grasslands, and spinifex. Undulating plains with eucalypt woodlands and mixed grasses. Dipping or gently folded limestone, calcareous sandstone and shale of Devonian age. Formed by partial dissection of the Fitzroy surfaces - undulating terrain: undulating plains in strike belts up to 6.4 m wide and 80 km long, with low interfluves and rocky surfaces, comprising plateaus, rounded hills, and cuestas, up to 30 m high; sandy or calcareous alluvial plains in the lowest parts; moderately dense rectangular pattern of strike-controlled drainage; relief mainly less than 9 m."

Six land units are described by Payne and Schoknecht (2011) for the Neillabublica land system, three of which would be relevant to the current study area:

- Unit 2 - interfluves: up to 4.8 km wide; pebble-strewn slopes typically less than 2%, with local outcrop; marginally dissected up to 6 m; shallow dark brown to dark grey, loamy to clayey, calcareous soils; spinifex steppe and open woodlands of *Triodia wiseana* and *Corymbia dichromophloia*[2] alliance;
- Unit 4 – cracking clay plains: up to 1.6 km in extent, with slopes less than 0.5% and hummocky surfaces; supporting tussock grasslands of *Chrysopogon* spp. and *Dichanthium fecundum,* often with scattered *Bauhinia cunninghamii;*
- Unit 6 – channels: up to 45 m wide and 3 m deep; bed-loads range from sand to boulders on bedrock; fringing forests and woodlands of *E. camaldulensis* and *Terminalia platyphylla* community in larger channels, with *Bauhinia cunninghamii* and *Lophostemon grandiflorus* woodlands in smaller streams.

Hills and some interfluves in the Neillabublica land system (including those in the study area) comprise stable, rocky surfaces supporting hard spinifex, which are not generally prone to erosion. In contrast, plains and drainage floors support attractive, preferentially grazed pastures. Controlled grazing is essential in the latter areas to prevent deterioration of these preferred pastures (Payne and Schoknecht 2011).

4.3.2 Windjana Land System

The Windjana land system covers a total area of 1,382 km² and is summarised by Payne and Schoknecht (2011) as:

> "Rocky limestone hill ranges, outcrop and shallow calcareous earths, spinifex and scattered trees. Local grasslands on cracking clay soils. Geology is dipping or gently folded limestone, calcareous sandstone and shale of Devonian age. Formed by dissection of the Kimberley surface – hill lands: strike belts up to 6.4 km wide and 80 km long, comprising hill ranges, plateaus and cuestas, with narrow bevelled crests and with short lower slopes;

[2] NB. All references to *Corymbia dichromophloia* from the broader studies of Payne and Schoknecht (2011) and Beard (1979) would represent *C. opaca* in the current study area.

restricted cracking clay plains in the lowest parts; sparse to moderately dense rectangular or branching pattern of incised valleys with strike-directed trunk drainage; relief up to 75 m."

Four land units are described by Payne and Schoknecht (2011) for this land system, only one of which would be relevant to the current study area:

- Unit 2 – lower slopes: concave, up to 5% and less than 800 m long; locally with alluvial fans; pebble-strewn surfaces with local outcrop; limestone outcrop with shallow dark brown to dark grey, loamy to clayey calcareous soils; open woodlands, very scattered shrubs and ground storey of *Triodia wiseana* and *Corymbia dichromophloia*[2] alliances.

4.4 Beard's Vegetation Units

John Beard prepared a series of maps of the vegetation of Western Australia from the 1960s to the 1980s, at varying scales from 1:250,000 to 1:1,000,000. Beard also identified a number of phytogeographic regions as part of this work.

The study area is located within the Northern Botanical Province, and more specifically in the western section of the Hall Botanical District (Beard 1979), which corresponds approximately to the Ord Victoria Plains bioregion (see Section 4.1). Beard described the climate of this district as being relatively drier than the other Kimberley districts, with rainfall generally ranging from 350 mm to 500 mm per year and a dry season of 8-9 months. The Ord Victoria Plains were described as being underlain by Palaeozoic rocks, including Antrim Plateau Volcanics, limestone, shale and siltstone of Cambrian age and the Elder Sandstone of probably Devonian age. Vegetation was described as being closely correlated with the underlying geology.

Beard (1979) mapped two vegetation units over the various components of the study area (as summarised in Table 4.2):

- Napier Hills South 746, described as a low tree steppe of the bloodwood *Corymbia dichromophloia*[2] over a hummock grassland of Limestone Spinifex (*Triodia wiseana*). This broad vegetation unit occurs over a range of approximately 300 km in the eastern Dampierland and western Ord Victoria Plains bioregions, and the study area is located towards the southeastern end of this range. Some of the northern stands of the Napier Hills South 746 vegetation unit are represented in the conservation estate, occurring within Geikie Gorge National Park, Brooking Gorge Conservation Park and Devonian Reef Conservation Park. This unit is mapped over the western and eastern sections of Mimbi Northwest, the northern section of Mimbi East, and the entirety of Mimbi Northeast.
- Napier Hills South 878, described as isolated trees of Snappy Gum (*Eucalyptus brevifolia*) and the bloodwood *Corymbia dichromophloia*[2] over an open hummock grassland of Soft Spinifex (*Triodia pungens*) and Lobed Spinifex (*Triodia intermedia*). This unit occurs over a range of only 65 km in the western section of the Ord Victoria Plains bioregion and is not represented within any conservation reserves. This unit is mapped over the Mimbi Corridor and the midsection of Mimbi Northwest.

Based on the finer-scale vegetation types recorded in the study area, the Napier Hills South 746 unit is considered to most accurately represent the vegetation occurring on site (see Section 5.1).

Table 4.2: Beard's (1979) vegetation units intersected by the study area.

Component of Study Area	Area of Beard's Vegetation Unit (ha)	
	Napier Hills South 746	Napier Hills South 878
Mimbi Northwest	76.0 ha	26.2 ha
Mimbi East	3.0 ha	1.3 ha
Mimbi Northeast	17.3 ha	–
Mimbi Corridor	–	8.5 ha

4.5 Significant Communities Known from the Locality

All of the TECs listed for the Kimberley are associated with tidal mudflats, monsoon vine thickets, rainforest remnants or mound springs (Department of Parks and Wildlife 2014a). All of the PECs are associated with either wetlands (including swamps, mound springs and clay pans), alluvial flats fringing the Ord River, monsoon vine thickets, mangroves, coastal dune and pindan areas, sandstone gorges, caves or limestone hills (Department of Parks and Wildlife 2014b).

While a small spring area was identified in Mimbi Northwest, the vegetation at this site did not correspond to any of the described PECs (see Section 5.1). As none of the other landforms are present in the current study area, no TECs or PECs are relevant to this assessment.

4.6 Significant Flora Species Known from the Locality

A search of the NatureMap database for species of conservation significance recorded previously from the locality returned two Priority 1 flora species within 40 km of the study area:

- *Trianthema kimberleyi*, known from a single location 23 km southwest of the study area, where it occurs on schistose soil on a flat hill; and
- *Triodia pascoeana,* known from a few scattered locations through the eastern Dampierland bioregion and western Ord Victoria Plains bioregion, the closest of which appears to be on the Lawford Range, 400 m east of Mimbi Northeast.

Two additional Priority species were recorded during the recent surveys of the nearby CLA2 and CP1 study areas (Biota 2014a, and 2014b respectively):

- *Aristida polyclados* (Priority 1) was recorded from CLA2; and
- *Pterocaulon xenicum* (Priority 3) was recorded from both areas.

No flora species listed as Threatened under either the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the WA *Wildlife Conservation Act 1950* occur in the central southern Kimberley.

5.0 Key Characteristics of the Study Area

5.1 Landforms, Vegetation and Disturbance

The study area is located in the broad valley between the Emanuel and Lawford Ranges (see Figure 5.1). The dominant landforms comprise low pediment slopes with a black clay loam substrate, which make up the majority of the area except for the western half of the Mimbi Corridor. Patches of black clay are common on alluvial plains fringing drainage areas, particularly in the central section of Mimbi Northwest and the western half of the Mimbi Corridor. Patches of outcropping limestone pavement are present in places, particularly in the western section of Mimbi Northwest. The northwestern edge of Mimbi Northwest and the northeastern corner of Mimbi Northeast extend marginally onto the footslopes of the Emanuel and Lawford Ranges, respectively, and a small hill formed from limestone boulders is also present at the western edge of Mimbi Northwest.

Drainage through the valley is to the south, through Pinnacle Creek (which intersects Mimbi Northwest and the western end of the Mimbi Corridor) and Mimbi Creek (which intersects the central section of the Mimbi Corridor and runs along the southern boundary of Mimbi East). A small but apparently permanent spring was observed along Pinnacle Creek in Mimbi Northwest (see Figure 5.1), and some small ephemeral pools were also observed to have formed where limestone sheets outcrop in this creek near the northeastern corner. There are anecdotal reports that large permanent springs in Pinnacle Creek to the north of the study area have dried up in recent years (R. Nuggett to G. Taylor, Tourism WA, pers. comm. 2015).

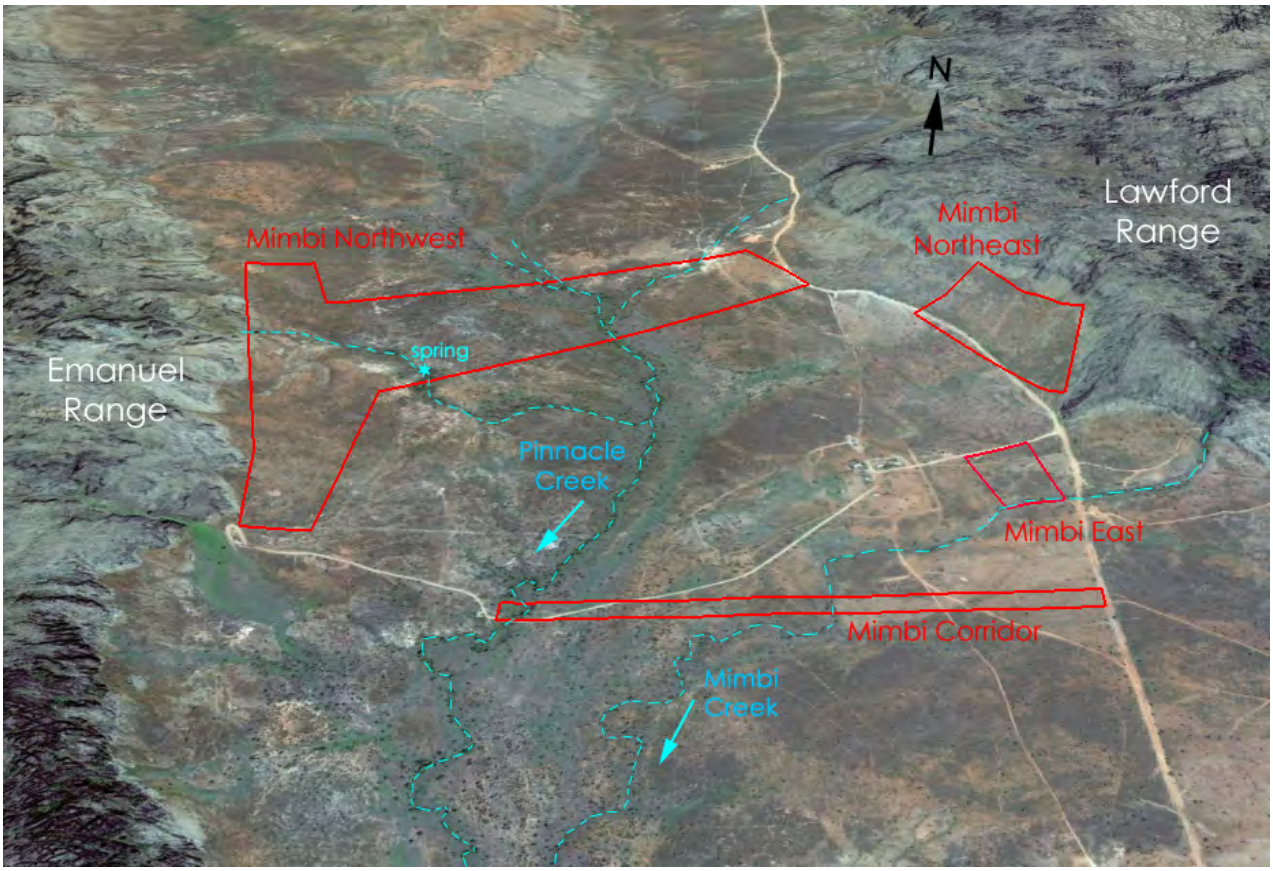

Figure 5.1: A bird's-eye view of significant landform features of the study area, including direction of drainage. Imagery sourced from Google Earth; oblique view and 3x vertical exaggeration applied.

Most of the vegetation of the study area was in Excellent condition (see Appendix 2). The main disturbance in the area comprised some infestations of serious weeds (**Cenchrus* species and **Aerva javanica*) in the western section of the Mimbi Corridor, and along the verge of the Mt Pierre Station access road at the edges of Mimbi Northwest and Mimbi Northeast (see Section 5.2.4).

Grazing and trampling by horses was also noted, particularly along the minor drainage lines, and a defined horse pad was present across Mimbi East (Plate 5.1). There were few signs of human disturbance, apart from several vehicle tracks associated with the community and Mt Pierre Station, and a dump of cars and some large rubbish items in the southwest of Mimbi Northwest (Plate 5.2). The study area had a variable fire history: some sections had been relatively recently burnt (within the last 2 years), while other parts appeared to be long unburnt.

Plate 5.1: Well-developed horse pad in Mimbi East.

Plate 5.2: Car dump in Mimbi Northwest.

The main vegetation types in the study area are as follows:

1. *Corymbia opaca* scattered low trees over *Triodia wiseana* hummock grasslands

This vegetation dominated the broad pediment slopes within all of the camping ground areas and also dominated the colluvial plain in the eastern half of the Mimbi Corridor (Plate 5.3). It was consistent with the Napier Hills South 746 vegetation association described by Beard (1979) (see Section 4.4). While the bloodwood *Corymbia opaca* was the ubiquitous dominant, scattered trees of *Eucalyptus tectifica* (Darwin Box) also occurred in all of the areas and *E. pruinosa* subsp. *pruinosa* (Silver Box) was common in the easternmost quarter of the Mimbi Corridor. Shrubs were typically sparse but included scattered *Acacia inaequilatera* and *Grevillea pyramidalis* subsp. *leucadendron*, and occasional patches of *Acacia bivenosa* open shrubland were noted in all but Mimbi East. The dominant spinifex throughout the study area was the Fitzroy Crossing form of *Triodia wiseana* (Limestone Spinifex), and *Sorghum stipoideum* (Annual Sorghum) was common in burnt areas and along the road verges. Other typical species included the low shrubs *Corchorus sidoides* subsp. *sidoides* (Flannel Weed), *Pterocaulon xenicum* (a Priority 3 species; see Section 5.2.2) and *Tephrosia* sp. Northern (K.F. Kenneally 11950), the grass *Eragrostis desertorum* (Desert Lovegrass), and the herbs *Buchnera asperata, Polymeria lanata* and *Ptilotus corymbosus*. This vegetation was generally in Excellent condition, containing few weeds and not being preferred for grazing. A thick and intact algal crust was usually present on the soil surface.

Plate 5.3: *Corymbia opaca* scattered low trees over *Triodia wiseana* hummock grasslands: Mimbi Northwest (left) and Mimbi Northeast (right).

2. *Gyrocarpus americanus* scattered low trees over *Triodia wiseana* hummock grasslands

The small limestone hill at the western edge of Mimbi Northwest, along with some rocky areas of footslope adjacent to the Emanuel and Lawford Ranges in Mimbi Northwest and Mimbi Northeast, supported scattered *Gyrocarpus americanus* subsp. *pachyphyllus* (Helicopter Tree) over relatively similar spinifex hummock grasslands to the surrounding pediment slopes (Plate 5.4). The limestone hill supported some additional species that were not common elsewhere, such as *Triumfetta albida* and *T. incana*, and scattered shrubs of *Cullen pustulatum* were only recorded on the footslopes of the Lawford Range in the southeastern corner of Mimbi Northeast. This vegetation was in Excellent condition.

Plate 5.4: *Gyrocarpus americanus* scattered low trees over *Triodia wiseana* hummock grasslands: limestone hill in Mimbi Northwest (left) and rocky footslope in Mimbi Northeast (right).

3. *Melaleuca lasiandra, Acacia ampliceps* scattered shrubs over *Triodia wiseana* hummock grasslands

This vegetation occurred in what appeared to be a somewhat swampy area in the central section of Mimbi Northwest, between the two tributaries of Pinnacle Creek (Plate 5.5). Scattered low trees of *Corymbia opaca* were also present. While the vegetation was not substantially different to the surrounding areas, some species recorded here were not common elsewhere in the study area, particularly the sedge *Schoenus falcatus* and the herb *Scaevola amblyanthera*. This vegetation was in Excellent condition.

4. *Triodia inaequiloba* hummock grasslands

Some small patches of *Triodia inaequiloba* hummock grasslands were present in the northwestern section of Mimbi Northwest, occurring on slightly elevated rises of lateritised limestone. The blueish colour of the foliage of this species was in distinct contrast to the brighter green colour of *Triodia wiseana* (Plate 5.6). These areas supported few other species, typically comprising the grasses *Eragrostis desertorum* and *Sporobolus australasicus*, and the herbs *Ptilotus calostachyus* and *P. gardneri*. This vegetation was in Excellent condition.

Plate 5.5: *Melaleuca lasiandra, Acacia ampliceps* scattered shrubs over *Triodia wiseana* hummock grassland (Mimbi Northwest).

Plate 5.6: *Triodia inaequiloba* hummock grassland (Mimbi Northwest).

5. *Acacia synchronicia, A. ampliceps* scattered tall shrubs over *Xerochloa laniflora* tussock grasslands

This vegetation occurred in a few small patches of dark grey fine sandy clay loam on alluvial plains in the western section of Mimbi Northwest, north of the spring in Pinnacle Creek (Plate 5.7). Other typical species included the low shrub *Solanum quadriloculatum*, the annual grass *Sporobolus australasicus*, and the herbs *Gomphrena canescens* subsp. *canescens, Heliotropium cunninghamii, H. tanythrix, Portulaca filifolia* and *Ptilotus corymbosus*. While this vegetation appeared to be in Good condition, with only scattered **Cenchrus* weeds, *Xerochloa* species typically occur in relatively saline habitats; this vegetation may therefore be indicative of increased salinity in the substrate in these areas.

Plate 5.7: *Xerochloa laniflora* tussock grassland (Mimbi Northwest).

6. *Bauhinia cunninghamii* scattered low trees over *Dichanthium fecundum* tussock grasslands

This vegetation occurred patchily throughout the study area in areas with a heavier clay substrate than the surrounding spinifex vegetation, for example on alluvial plains (Plate 5.8). Only the largest areas are mapped in Appendix 4. The tussock grassland was typically dominated by *Dichanthium fecundum* (Curly Bluegrass), together with lesser amounts of other species such as *Chrysopogon pallidus* (Ribbongrass) and *Sehima nervosum* (Whitegrass). Tall shrubs were typically only scattered, however *Acacia synchronicia* and **Vachellia farnesiana* were common in the western half of the Mimbi Corridor. Although preferentially grazed and more susceptible to weed invasion, this vegetation was generally in Very Good condition. The exception comprised the stands in the western half of the Mimbi Corridor, which were considered to be in Good to Poor condition due to greater signs of grazing and weed invasion (particularly by **Vachellia farnesiana* and **Cenchrus* species).

Plate 5.8: *Bauhinia cunninghamii* scattered low trees over *Dichanthium fecundum* tussock grassland: Mimbi Northwest (left) and Mimbi Corridor (right).

7. Riparian vegetation: mixed woodlands over mixed tussock grasslands

Riparian vegetation occurred along the minor creeklines in the study area: Pinnacle Creek (Plate 5.9) and Mimbi Creek (Plate 5.10). The overstorey typically comprised scattered trees to a woodland dominated by a mixture of *Lophostemon grandiflorus* subsp. *riparius* (Northern Swamp Mahogany), *Terminalia platyphylla* (Wild Plum), *Bauhinia cunninghamii*, *Corymbia opaca* and/or *Eucalyptus tectifica*, but a small patch of *Lophostemon grandiflorus* subsp. *riparius* forest was noted at the northwestern corner of Mimbi Northwest (Plate 5.11). *Terminalia carpentariae* (Wild Peach) was a dominant tree in Mimbi Creek along the southern boundary of Mimbi East, and *Eucalyptus camaldulensis* (River Gum) was a co-dominant at the same location and in Pinnacle Creek at the western end of the Mimbi Corridor. The ground layer typically comprised a tussock grassland of *Dichanthium fecundum, Chrysopogon pallidus* and/or *Sehima nervosum* on the creek banks, with a mixed herbland often present in the creek bed. The Priority 1 hummock grass *Triodia pascoeana* was recorded along Pinnacle Creek in the eastern section of Mimbi Northwest (see Section 5.2.2).

Plate 5.9: Riparian vegetation in Pinnacle Creek: Mimbi Northwest (left) and Mimbi Corridor (right).

Plate 5.10: Riparian vegetation in Mimbi Creek: Mimbi Corridor (left) and Mimbi East (right).

Plate 5.11: *Lophostemon grandiflorus* forest in Pinnacle Creek (Mimbi Northwest).

8. Riparian vegetation: *Lophostemon grandiflorus* woodland over *Terminalia platyphylla* low woodland over mixed open sedgelands

While most of the creeks were dry, a small permanent spring with a pool of water approximately 10 m long by 3 m wide, and 30-60 cm deep, was recorded on Pinnacle Creek at the southern edge of Mimbi Northwest (Figure 5.1 and Plate 5.12). The overstorey vegetation at this site was similar to the remainder of the creeklines (a *Lophostemon grandiflorus* subsp. *riparius* woodland over *Terminalia platyphylla* low woodland), however the understorey comprised a mixed open sedgeland dominated by *Cyperus vaginatus* (Stiffleaf Sedge), *Schoenus falcatus, Typha domingensis* (Bulrush) and the Priority 3 species *Fimbristylis sieberiana* (see Section 5.2.2). This vegetation was considered to be in Very Good condition; although horses were observed to be visiting the spring, there were no signs of heavy grazing or trampling, and only scattered weeds were recorded.

Another patch of dense *Typha domingensis* was recorded in Pinnacle Creek upstream of the spring, but was largely dead at the time of survey; this area does not appear to support permanent water.

Plate 5.12: Permanent spring in Pinnacle Creek (Mimbi Northwest).

5.2 Flora

5.2.1 Overview

A total of 206 native flora taxa from 126 genera in 55 families were recorded from the study area (Appendix 5), including four Priority flora species (Section 5.2.2). A total of 16 introduced flora species (weeds) were also recorded (Section 5.2.4).

5.2.2 Flora of Conservation Significance

No Threatened flora species were recorded from the study area and none would be considered likely to occur.

No Priority flora were recorded from the Mimbi Corridor. Four Priority flora species were recorded from the other parts of the study area during the field survey (Table 5.1), including two that have not been previously recorded in the locality (within 40 km; see Section 4.6). All of these specimens were confirmed by Dr Matthew Barrett.

Table 5.1: Summary of Priority species recorded in the study area.

Species	Status	Area	Number of Individuals / Density
Triodia pascoeana	Priority 1	Mimbi Northwest	Scattered in a section of Pinnacle Creek.
Ipomoea racemigera	Priority 2	Mimbi East	Scattered at one location in Mimbi Creek.
Fimbristylis sieberiana	Priority 3	Mimbi Northwest	Scattered at the spring on Pinnacle Creek.
Pterocaulon xenicum	Priority 3	Mimbi Northwest	141 plants at 19 locations.
		Mimbi East	51 plants at 7 locations.
		Mimbi Northeast	13 plants at 2 locations.

Location details are provided in Appendix 4, and each species is described briefly below:

- *Triodia pascoeana* (Priority 1)
  This spinifex with very small florets is known from a small number of locations in the eastern section of the Dampierland bioregion and the western section of the Ord Victoria Plains bioregion, the closest of which is on the Lawford Range approximately 400 m east of Mimbi Northeast. This species was recorded from a section of Pinnacle Creek in the northeast of Mimbi Northwest (Appendix 4). It was also noted at another location approximately 0.5 km upstream in Pinnacle Creek, outside of the study area.
- *Ipomoea racemigera* (Priority 2)
  This creeper with white flowers is known from scattered locations in the Pilbara and a collection in the northern Kimberley. A single specimen from the study area was determined by Matthew Barrett as being "closest to this taxon, but with subtle differences". Unfortunately the material collected is not sufficient to provide a voucher to the WA Herbarium. The collection location was in Mimbi Creek, along the southern boundary of Mimbi East.
- *Fimbristylis sieberiana* (Priority 3)
  This perennial sedge is associated with permanent water and has a broad range, extending from the northern Kimberley through to several locations in the Pilbara bioregion. It was recorded only from the spring area on Pinnacle Creek, near the southern edge of Mimbi Northwest (Appendix 4), where it occurred as scattered individuals near the permanent pool.
- *Pterocaulon xenicum* (Priority 3)
  This daisy was recorded from all three of the survey polygons for the proposed camping grounds, occurring as scattered individuals through the general *Triodia wiseana* hummock grasslands (Plate 5.13). It was not recorded from the Mimbi Corridor. This species was also recorded from the nearby CLA2 and CP1 study areas (Biota 2014a, and 2014b respectively), and appears to be locally common.

Plate 5.13: *Pterocaulon xenicum*: growth form and flowers.

5.2.3 Other Flora of Interest

While not formally listed, some of the specimens collected from the study area are of interest for various other reasons, e.g. they appear to be new species, cannot be resolved and/or appear to represent substantial range extensions. Specimens will be submitted to the WA Herbarium for all taxa unless otherwise noted below:

- *Mitrasacme* sp.: a specimen collected from Pinnacle Creek in the northwestern section of Mimbi Northwest could not be matched to any described species and was determined as probably a new species (M. Barrett, pers. comm. 2015). This genus of delicate herbs is poorly collected and new taxa are continually being identified.
- *Cucumis althaeoides* is currently known only from the northern Kimberley, and the record from the study area would therefore represent a substantial range extension. The specimen collected has distinctly verrucose ('warty') seeds, and therefore cannot be *C. argenteus*, which would be more typical of the area but has smooth seeds.
- *Dysphania sphaerosperma* has a broad distribution through the state, but this is only the second collection for the Kimberley.
- *Eragrostis ? potamophila*: a single collection of annual grass from Mimbi Creek along the southern edge of Mimbi East could not be conclusively determined. Matt Barrett described it as "very small for *E. potamophila* but may be a dwarf form in semi-arid area". *Eragrostis potamophila* would be a range extension for the area, having been recorded previously only from the northern Kimberley.
- *Euphorbia ferdinandi*: a specimen of *Euphorbia* from the Mimbi Corridor had seeds matching *E. ferdinandi* (S. Dillon, WA Herbarium, pers. comm. 2015), a species not previously recorded from the Kimberley. The specimen also lacked gland appendages, ruling out the only variety that has been recorded in WA to date, var. *ferdinandi.* Unfortunately the material is of poor quality, and unsuitable to voucher.
- *Euphorbia* sp. (aff. *fitzroyensis/wheeleri*): a specimen of *Euphorbia* from the western part of Mimbi Northwest had characters intermediate between *E. fitzroyensis*, known from the adjacent Dampierland bioregion, and *E. wheeleri*, which has not previously been recorded from the Kimberley (S. Dillon, WA Herbarium, pers. comm. 2015). The characters shared with specimens of *E. fitzroyensis* held at the WA Herbarium included relatively short bifid styles with clavate apices (i.e. forked styles with club-shaped tips), and seeds of a similar size and shape; however the seed had a similar reticulate-foveate exotesta (seed coat) as specimens of *E. wheeleri* (S. Dillon, WA Herbarium, pers. comm. 2015). As for the previous entity, the material is of poor quality and unsuitable to voucher.
- *Senna sericea* has a broad range from the eastern half of the Pilbara to the inland desert regions, but has not been previously recorded from the Kimberley. The specimen of *Senna ? sericea* from the study area will be offered to the WA Herbarium for lodgement as a voucher, but may not be accepted as it is lacking reproductive material.
- *Eucalyptus argillacea:* a single tree was recorded from the Mimbi Corridor. While known from the Central Kimberley bioregion, this is the first record for the Ord Victoria Plains bioregion.
- *Fimbristylis elegans:* although known from the northern Kimberley and from the Pilbara bioregion to the south, this is the first record for the Ord Victoria Plains bioregion.
- *Triumfetta albida*: the record from the study area extends the distribution of this species to the southeast, and represents the first collection for the Ord Victoria Plains bioregion.

5.2.4 Introduced Flora (Weeds)

A total of 16 species of introduced flora (weeds) were recorded from the study area (Table 5.2; see Appendix 4 for further details). One of the species, **Calotropis procera*, is a declared pest under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Table 5.2: Summary of weeds recorded in the study area.

Species	Location				
	Mimbi NW	Mimbi E	Mimbi NE	Mimbi Corridor	Outside Study Area
**Aerva javanica*	– (just outside)	✓	✓	✓	Along Mt Pierre Station road and at Mimbi tip; also recorded from CLA2 (Biota 2014a) and CP1 (Biota 2014b).
**Bidens bipinnata*	✓	–	–	–	
**Calotropis procera*	–	–	✓	–	One plant just east of Mimbi NE; also recorded outside CLA2 (Biota 2014a).
**Cenchrus setiger*	✓	✓	✓	✓	Along Mt Pierre Station road and at Mimbi tip; also recorded from CLA2 (Biota 2014a) and CP1 (Biota 2014b)..
**Cenchrus ciliaris*	✓	✓	✓	✓	Along Mt Pierre Station road and at Mimbi tip.
**Echinochloa colona*	✓	–	–	–	
**Euphorbia hirta*	✓	–	–	✓	
**Flaveria trinervia*	✓	–	–	–	
**Ipomoea nil*	✓	✓	✓	✓	Pinnacle Creek to south.
**Malvastrum americanum*	✓	✓	✓	✓	Also recorded from CLA2 (Biota 2014a) and CP1 (Biota 2014b).
**Passiflora foetida* var. *hispida*	✓	–	–	✓	
**Physalis angulata*	✓	–	–	–	
**Stylosanthes hamata*	✓	✓	–	✓	Also recorded from CLA2 (Biota 2014a) and CP1 (Biota 2014b).
**Tribulus terrestris*	✓	✓	–	✓	
**Urochloa mosambicensis*	–	–	–	✓	
**Vachellia farnesiana*	✓	✓	✓	✓	Also recorded outside CLA2 (Biota 2014a).

Each species is described briefly below:

- **Aerva javanica* (Kapok Bush; Plate 5.14) was relatively common in the western half of the Mimbi Corridor, on the sandy soils of the somewhat degraded area of alluvial plain between Pinnacle Creek and Mimbi Creek. It was also present along the Mt Pierre Station access road, just to the east of Mimbi Northwest; on the heavier soils along the western boundary of Mimbi Northeast; and there was a single record from near Mimbi Creek at the southern edge of Mimbi East. It was also noted at the Mimbi rubbish tip.
- **Bidens bipinnata* (Bipinnate Beggartick) was recorded from two locations along Pinnacle Creek in the western section of Mimbi Northwest.
- **Calotropis procera* (Calotrope; Plate 5.15) was recorded from a single plant at the eastern edge of Mimbi Northeast, and another single shrub was found just to the east near the water bore. **Calotropis procera* is a declared pest under the BAM Act in the C3 (Management) category. Pests are assigned to this category if they are established in WA but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest. With regards to the current study area, the appropriate management measure would comprise active control (spraying with herbicides to destroy the underground tubers).
- **Cenchrus setiger* (Birdwood Grass; Plate 5.17) was relatively common in the western half of the Mimbi Corridor, on the sandy soils of the somewhat degraded area of alluvial plain between Pinnacle Creek and Mimbi Creek. Infestations in this area frequently provided up to 60% cover. It was also present in Mimbi Northwest and Mimbi Northeast, particularly in areas near to the Mt Pierre Station access road, and was recorded from scattered locations in Mimbi East.

- **Cenchrus ciliaris* (Buffel Grass) was less frequently recorded but had a similar distribution to **C. setiger*.
- **Echinochloa colona* (Awnless Barnyard Grass) is an annual grass that is common in wet areas in the Kimberley and Pilbara. This species was recorded from a single location in Pinnacle Creek in the western section of Mimbi Northwest.
- **Euphorbia hirta* (Asthma Plant) was recorded from two locations in the Mimbi Corridor (in Mimbi Creek and Pinnacle Creek), and from one location in Pinnacle Creek in Mimbi Northwest. This annual herb is widespread from the Kimberley to the Pilbara.
- **Flaveria trinervia* (Speedy Weed) was recorded from two locations in Mimbi Northwest; one in Pinnacle Creek near the spring, and one in the northeast of the area. This annual daisy is widespread from the Kimberley through to near Wiluna.
- **Ipomoea nil* (Plate 5.18) was recorded from scattered locations in Pinnacle Creek and Mimbi Creek in each of the Mimbi Northwest, Mimbi East and Mimbi Corridor areas. Single individuals were also occasionally recorded growing amongst shrubs in the Mimbi Northwest and Mimbi Northeast areas. This creeper is a widespread weed through the Kimberley and has been recorded previously from Pinnacle Creek to the south of the study area.
- **Malvastrum americanum* (Spiked Malvastrum; Plate 5.16) was recorded from several locations on the heavier soil towards the southern boundary of Mimbi Northeast, and was also recorded from single locations in Mimbi Creek in Mimbi East and the Mimbi Corridor, and from a location in Pinnacle Creek at the western edge of Mimbi Northwest. This herb to low shrub is common in drainage areas and on clay soils from the Kimberley through to Carnarvon, and south as far as the Nullarbor.
- **Passiflora foetida* var. *hispida* (Stinking Passion Fruit) was recorded from five locations in Pinnacle Creek, four in Mimbi Northwest and one in the Mimbi Corridor. This creeper is abundant through the Kimberley, and is also known from scattered locations in the Pilbara and further south.
- **Physalis angulata* was recorded from two locations in Pinnacle Creek in the northeastern section of Mimbi Northwest. This annual herb is a common weed of creeklines and floodplains in the Kimberley, with scattered other locations in the Pilbara and further south.
- **Stylosanthes hamata* (Verano Stylo; Plate 5.19) was recorded from four locations along road verges in the Mimbi Corridor; from two locations along a road and two locations in Mimbi Creek in Mimbi East; and from two scattered locations in Mimbi Northwest (one on a pediment slope and one in Pinnacle Creek). This herb to low shrub is a common weed of the Kimberley region, with scattered records from the Pilbara coast and further inland.
- **Tribulus terrestris* (Caltrop) is a common weed throughout the state. This prostrate annual herb has prickly fruit and typically grows on sandy soils in disturbed areas. It was recorded from two locations in Mimbi Northwest, and single locations in Mimbi East and the Mimbi Corridor.
- **Urochloa mosambicensis* (Sabi Grass) was recorded from a single location near Mimbi Creek in the Mimbi Corridor. This perennial grass occurs widely through the Kimberley region, but is not considered particularly aggressive.
- **Vachellia farnesiana* (Mimosa Bush; Plate 5.20) is a widespread weed of drainage areas and clayey plains from the Kimberley through to north of Perth. This species was recorded relatively frequently in Mimbi Northwest, mainly along Pinnacle Creek; on the heavier soils along the southern margin of Mimbi Northeast; and in the somewhat degraded alluvial plain in the western half of the Mimbi Corridor. It was also recorded from a single location on Mimbi Creek in Mimbi East.

Plate 5.14: **Aerva javanica*.

Plate 5.15: **Calotropis procera* plant and flowers.

Plate 5.16: **Malvastrum americanum.*

Plate 5.17: **Cenchrus setiger* plant and inflorescence.

Plate 5.18: **Ipomoea nil.*

Plate 5.19: **Stylosanthes hamata*.

Plate 5.20: **Vachellia farnesiana.*

5.3 Other Features

5.3.1 Aboriginal and Non-Indigenous Heritage

One worked stone flake of brown chert was found in the Mimbi Corridor at 190193 mE, 7926357 mN (Plate 5.21) and some worked quartz was also seen near the spring in Mimbi Northwest (S. Ford, Biota, pers. obs.).

Plate 5.21: Chert flake (Mimbi Corridor).

5.3.2 Bush Foods

A number of species that are used as bush foods in other parts of the Kimberley were noted in the study area. These comprised:

- *Acacia ampliceps* (Salt Wattle) and *A. colei* var. *colei* (Cole's Wattle): have edible seeds, but uncertain whether the species were used locally;
- *Amyema sanguinea*: edible fruit;
- *Bauhinia cunninghamii* (Bauhinia): nectar and sugarbags;
- *Capparis lasiantha* (Split Jack) and *C. umbonata* (Wild Orange): edible fruit;
- *Carissa lanceolata* (Conkerberry; Plate 5.22): edible fruit;
- *Cassytha filiformis* (Love Vine): edible fruit;
- *Celtis philippensis*: edible fruit;
- *Cochlospermum fraseri* (Kapok Bush): edible roots; present only as very occasional shrubs in Mimbi Northwest and Mimbi Northeast;
- *Corymbia opaca* (a bloodwood; Plate 5.23): galls on this species contain edible larvae;
- *Ficus aculeata* var. *indecora* (Sandpaper Fig, or Ranji; Plate 5.24): edible fruit;

- *Flueggea virosa* subsp. *melanthesoides* (Dogwood): edible fruit;
- *Hakea arborescens* (Common Hakea): edible seeds;
- *Ipomoea costata* (Rock Morning Glory; Plate 5.25): edible yams;
- **Passiflora foetida* var. *hispida* (Stinking Passion Fruit): edible fruit when ripe (but see Section 5.3.3);
- **Physalis angulata*: edible berries;
- *Santalum lanceolatum* (Northern Sandalwood): edible fruit;
- *Terminalia carpentariae* (Wild Peach): edible fruit;
- *Typha domingensis* (Bulrush): edible roots, stem and young flower spikes; and
- *Vigna lanceolata* (Maloga Vigna): this species is a pencil yam, however not all forms in the complex may have edible yams.

Plate 5.22: *Carissa lanceolata*: branchlets and edible berries.

Plate 5.23: *Corymbia opaca.*

Plate 5.24: *Ficus aculeata* var. *indecora.*

Plate 5.25: *Ipomoea costata.*

5.3.3 Toxic Plants

Four species that are or may be toxic were recorded from the study area:

- **Calotropis procera* (Calotrope, Rubber Bush; see Section 5.2.4) has toxic sap.
- *Grevillea pyramidalis* subsp. *leucadendron* (Caustic Bush; Plate 5.26) has caustic fruits, and is perhaps not appropriate to retain in a public camping ground. This species was present as scattered individuals in Mimbi Northwest and Mimbi East.
- **Passiflora foetida* var. *hispida* (Stinking Passion Fruit) has fruit that are edible when ripe, however these can be laxative in large quantities. In addition, the skin of green fruit is toxic, and the leaves and stems have irritant hairs that can cause skin rashes and blindness, so this species would not be desirable in a camping ground.
- *Solanum quadriloculatum* (Tomato Bush; Plate 5.27) is reported to have very poisonous fruit elsewhere in Australia. This species was scattered through the Mimbi Northwest area, and was also recorded at two locations in the southwestern corner of Mimbi Northeast and two locations in the Mimbi Corridor.

Where locations were recorded by the field botanists, these species are shown on the map in Appendix 4.

Visitors may need to be educated regarding the presence of these species in or near the camping grounds, and removal of some plants may be warranted.

Plate 5.26: *Grevillea pyramidalis.*

Plate 5.27: *Solanum quadriloculatum*: growth form, flower and fruit.

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6.0 Discussion and Recommendations

The sites selected for the proposed camping grounds appear generally suitable for this purpose, although camping ground 3 is relatively close to the Mimbi community and some more separation may be desirable. The clearing areas would need to take into account the presence of some limestone ridges (particularly in Mimbi Northwest). Although the areas have been slightly disturbed, reflecting their proximity to the adjacent community, the vegetation of the study area was overall still relatively intact. Scattered weeds were recorded throughout the study area, but dense infestations were restricted to areas along the Mt Pierre Station access road and in the western half of the Mimbi Corridor. One plant of the declared pest **Calotropis procera* (Calotrope, or Rubber Bush) was recorded from the Mimbi Northeast area, with another plant found just outside.

From a biological perspective, the main issue for development of the camping grounds is the presence of four Priority listed species, one of which is located at a small permanent spring that would be of local significance. With regards to these species:

- *Ipomoea racemigera* (Priority 2) was recorded in Mimbi Creek, along the southern boundary of Mimbi East. There should be no reason to clear along this creek, hence no impacts to this species would be expected.
- Two species were recorded only from Mimbi Northwest: *Triodia pascoeana* (Priority 1) was recorded from a section of Pinnacle Creek in the northeast, while *Fimbristylis sieberiana* (Priority 3) was recorded only from the spring area on Pinnacle Creek. The water pool at the spring would be of local significance, given that it appears to be the only permanent water source in the study area, and some conservation significant fauna have been recorded at this location (Biota 2015). Depending on the routes of the proposed access road linking camping grounds 1 and 2 and the proposed pipeline linking camping ground 2 to its water bore, the locations of *Triodia pascoeana* and *Fimbristylis sieberiana* could be directly impacted by clearing.

  Development of the access road linking camping grounds 1 and 2 also has the potential to impact drainage through Pinnacle Creek, which could cause indirect impacts to the Priority flora populations (e.g. through ponding of water on the upstream side; or erosion of the surrounding creek banks causing a build-up of silt downstream). The channels of this creek are deeply incised (to greater than 2 m) but generally quite narrow (often only 2-3 m wide). It should be possible to bridge these channels to avoid any change to water flows through this system.

  Although drawdown from the water bores could theoretically impact on water flow from the spring, only a small amount of water would be required to support the camping grounds (in the order of 2,500 kL/year; G. Taylor, Tourism WA, pers. comm. 2015). No significant impact on the spring would be expected.
- *Pterocaulon xenicum* (Priority 3) was recorded from all three of the proposed camping ground polygons: Mimbi Northwest, Mimbi Northeast and Mimbi East. This species appears to be locally common, and given its broad range (from the eastern Pilbara to the Northern Territory), it is likely that this species has been poorly collected rather than being genuinely rare. Given the common and widespread nature of this species in the locality, management would be limited to minimising clearing within the study area.

The following management recommendations are proposed to minimise impacts to the study area:

1. Rather than wholesale clearing of the camping ground polygons, individual camping bays should be developed around the limestone ridge features.
2. The routes of the access road linking camping grounds 1 and 2, and the proposed pipeline linking camping ground 2 to its water bore, should be selected such that they do not impact the permanent spring (which includes the population of the Priority 3 *Fimbristylis sieberiana*) or the location of the Priority 1 *Triodia pascoeana*.

3. Crossovers on the channels of Pinnacle Creek in Mimbi Northwest should be constructed so as to avoid any change to surface water flow in this drainage system.

4. Clearing should be kept to a minimum to minimise disturbance to the Priority 3 species *Pterocaulon xenicum*.

5. Control of the declared pest **Calotropis procera* (Calotrope, or Rubber Bush) at Mimbi East should be considered. Control of **Stylosanthes hamata* (Verano Stylo) would also be desirable to improve the amenity of the study area for camping, however this invasive species may be difficult to manage.

6. Clearing in the Mimbi Corridor should be conducted from east to west, to minimise the transfer of weed propagules from the species that are relatively abundant in the western half of the corridor (particularly **Aerva javanica* and **Cenchrus* spp.). Earth-moving equipment should be washed down after use in weed-infested areas, particularly the western half of the Mimbi Corridor and the verges of the Mt Pierre Station access road near Mimbi Northwest and Mimbi Northeast.

7. Consideration should be given to removal of any *Grevillea pyramidalis* and **Passiflora foetida* var. *hispida* plants in close proximity to the final camping ground/s due to their potential to cause harm.

8. Signs or brochures may be useful to provide information to visitors regarding the values of the camping grounds, particularly the presence of Priority flora species and bush food plants, and issues such as weeds and toxic plants.

7.0 Glossary

*	Used prior to a species name to denote a weed species.
aff.	Abbreviation of 'affinity'.
Annual (plant)	A plant that lives for only one year.
Cuesta	A ridge with a gentle slope on one side and a steep slope on the other.
EPBC Act	The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
Ephemeral (plant)	A plant that lives a very short time; less than one year, usually less than six months.
GIS	Geographic Information System.
IBRA	Interim Biogeographic Regionalisation for Australia.
PEC	Priority Ecological Community (see Appendix 1 for more on the WA conservation framework).
sens. lat.	Abbreviation of 'sensu lato' (Latin), meaning 'in the broad sense'.
sp. (plural: spp.)	Abbreviation of 'species'.
subsp.	Abbreviation of 'subspecies'.
Taxon (plural: taxa)	A taxonomic distinction at species level or below.
TEC	Threatened Ecological Community (see Appendix 1 for more on the WA conservation framework).
Threatened flora	Flora species protected by legislation, either listed under the Commonwealth EPBC Act or the WA *Wildlife Conservation Act 1950* (latter species known as Declared Rare Flora); see Appendix 1 for more on the WA conservation framework.
var.	Abbreviation of 'variety'.

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Appendix 1

Framework for Assessment of Conservation Significance of Communities and Species in WA

A. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities (DEC 2010)

1. General Definitions

Ecological Community
A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to Department of Parks and Wildlife Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An assemblage is a defined group of biological entities.

Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (e.g. substrate and topography), and the biotic factors.

Occurrence: a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

Adequately Surveyed is defined as follows:
"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

Community structure is defined as follows:
"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (e.g. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, e.g. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of Modification and Destruction of an ecological community:

Modification: "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

Destruction: "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

Note: Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

Threatening processes are defined as follows:
"Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community."

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced micro-organisms; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

2. Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

ECOLOGICAL COMMUNITIES

Presumed Totally Destroyed (PD)
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):

A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or

B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);

   ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);

   ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.

C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)
An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3. Definitions and Criteria for Priority Ecological Communities

PRIORITY ECOLOGICAL COMMUNITY LIST
Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities
Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities
Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

B. Conservation Codes for Western Australian Flora and Fauna
(Obtained from http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation_code_definitions.pdf)

Department of Parks and Wildlife

CONSERVATION CODES

For Western Australian Flora and Fauna

T **Threatened species**

Listed as Specially Protected under the *Wildlife Conservation Act 1950,* published under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

- Fauna that is rare or likely to become extinct are declared to be fauna that is in need of special protection
- Flora that are extant and considered likely to become extinct, or rare and therefore in need of special protection, are declared to be rare flora

Species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such. The assessment of the conservation status of these species is based on their national extent.

X **Presumed extinct species**

Listed as Specially Protected under the *Wildlife Conservation Act 1950,* published under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora).

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.

IA **Migratory birds protected under an international agreement**

Listed as Specially Protected under the *Wildlife Conservation Act 1950,* listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), relating to the protection of migratory birds.

S **Other specially protected fauna**

Listed as Specially Protected under the *Wildlife Conservation Act 1950*. Fauna declared to be in need of special protection, otherwise than for the reasons mentioned for Schedules 1, 2 or 3, are published under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Threatened Fauna and Flora are ranked according to their level of threat using IUCN Red List categories and criteria. *For example*: Carnaby's Cockatoo (*Calyptorynchus latirostris*) is listed as 'Specially Protected' under the *Wildlife Conservation Act 1950,* published under Schedule 1, and referred to as a 'Threatened' species with a ranking of 'Endangered'.

CR Critically Endangered - considered to be facing an extremely high risk of extinction in the wild.

EN Endangered - considered to be facing a very high risk of extinction in the wild.

VU Vulnerable - considered to be facing a high risk of extinction in the wild.

A list of the current rankings can be downloaded from the Parks and Wildlife Threatened Species and Communities webpage at http://dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/

P Priority species

Species that maybe threatened or near threatened but are data deficient, have not yet been adequately surveyed to be listed under the Schedules of the Wildlife Conservation (Specially Protected Fauna) Notice or the Wildlife Conservation (Rare Flora) Notice, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation dependent species that are subject to a specific conservation program are placed in Priority 5.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1: Priority One: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2: Priority Two: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3: Priority Three: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4: Priority Four: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority Five: Conservation Dependent species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).

Last updated 2 December 2014

Appendix 2

Vegetation Structural Classes and Condition Scale

Vegetation Structural Classes*

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs over 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs under 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses, Sedges, Herbs	Closed tussock grassland / bunch grassland / sedgeland / herbland	Tussock grassland / bunch grassland / sedgeland / herbland	Open tussock grassland / bunch grassland / sedgeland / herbland	Very open tussock grassland / bunch grassland / sedgeland / herbland	Scattered tussock grasses / bunch grasses / sedges / herbs

* Based on Muir (1977) and Aplin's (1979) modification of the vegetation classification system of Specht (1970):

Aplin, T.E.H. (1979). The Flora. Chapter 3 In O'Brien, B.J. (Ed.) (1979). *Environment and Science*. University of Western Australia Press.

Muir, B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve. *Records of the Western Australian Museum*, Suppl. No. 3.

Specht, R.L. (1970). Vegetation. In: G.W. Leeper (Ed.) *The Australian Environment*. 4th edn. Melbourne.

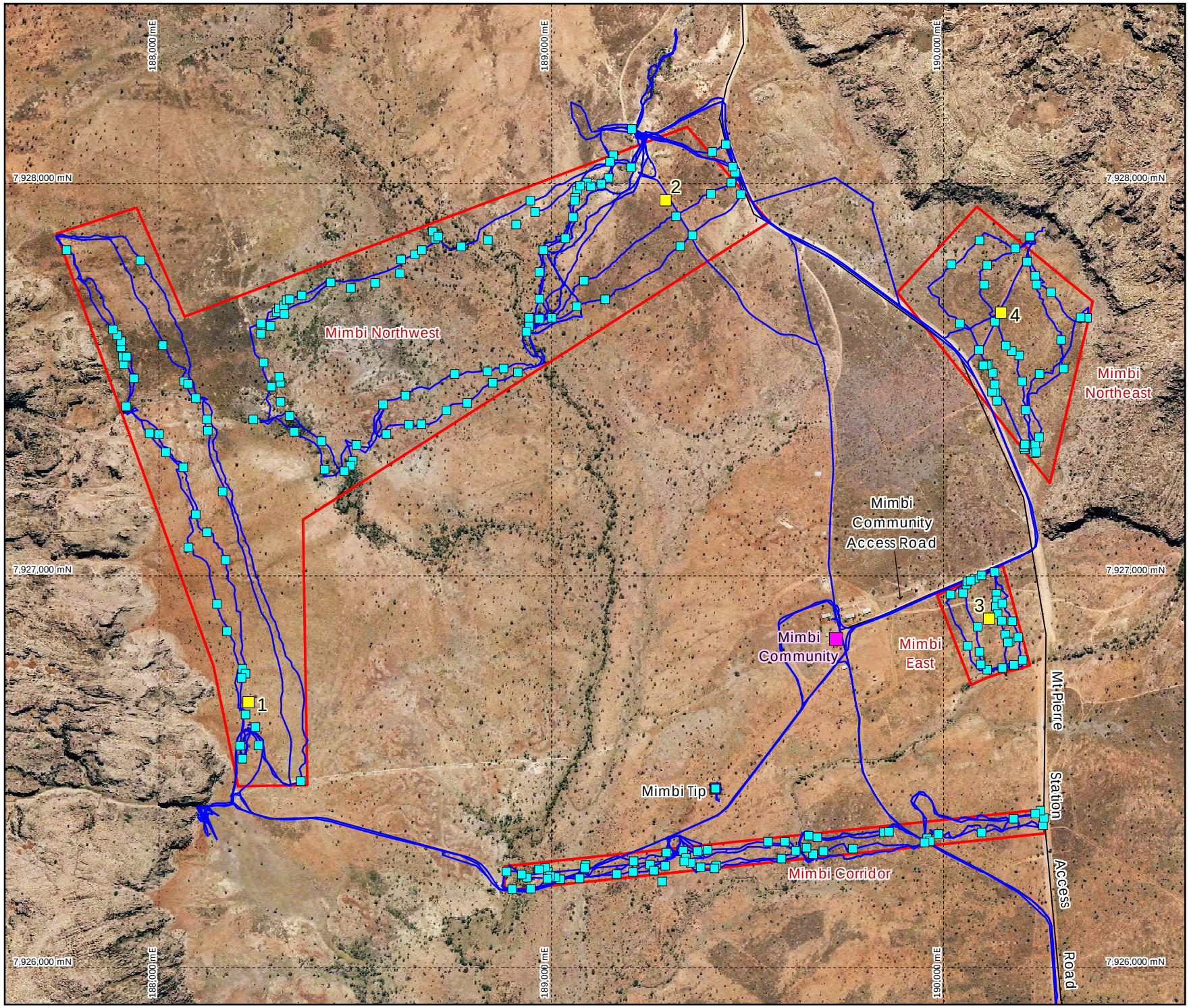
Vegetation Condition Scale*

E = Excellent (=Pristine of BushForever) Pristine or nearly so; no obvious signs of damage caused by the activities of European man.
VG = Very Good (= Excellent of BushForever) Some relatively slight signs of damage caused by the activities of European man. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds such as **Sonchus oleraceus* or **Cucumis* spp., or occasional vehicle tracks.
G = Good (= Very Good of BushForever) More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones such as **Cenchrus* spp.
P = Poor (= Good of BushForever) Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man, such as grazing, partial clearing (chaining) or frequent fires. Weeds as above, probably plus some more aggressive ones such as **Cenchrus* spp.
VP = Very Poor (= Degraded of BushForever) Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species including very aggressive species such as **Prosopis* spp.
D = Completely Degraded (= Completely Degraded of BushForever) Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

* Based on Trudgen M.E. (1988). A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Appendix 3

Survey Effort in the Study Area



Survey area

Local road

Proposed camping ground

Mimbi community

Mimbi tip

Survey Effort

GPS tracks

Mapping note

N

0 250 500

metres

Author: M Maier Drawn: K Webster

Dwg No.: 1066

Date: 07 Jul 2015 Revised: 08 Jul 2015

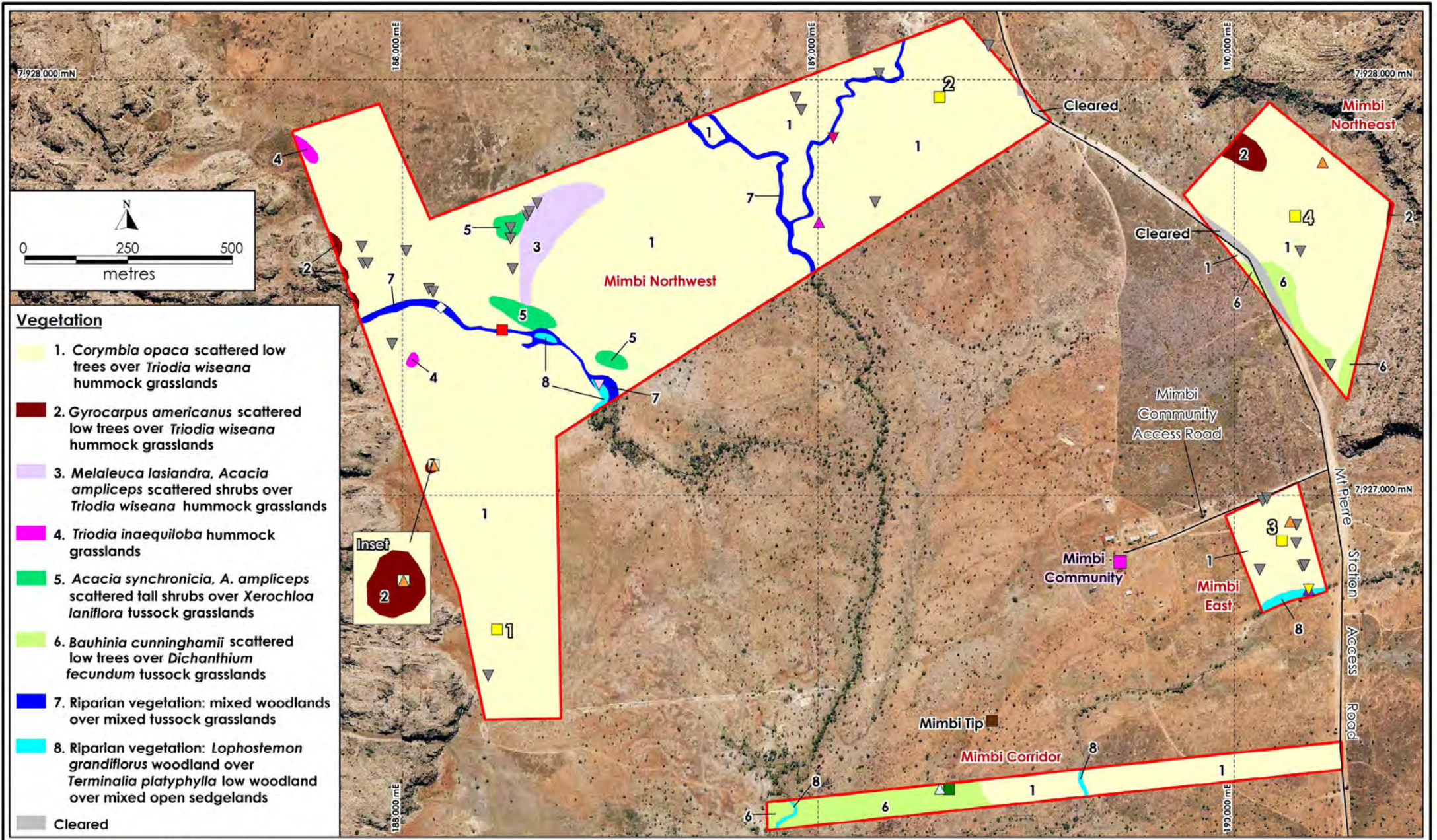
Projection: MGA Z50 (GDA94) Scale: 1:13,000

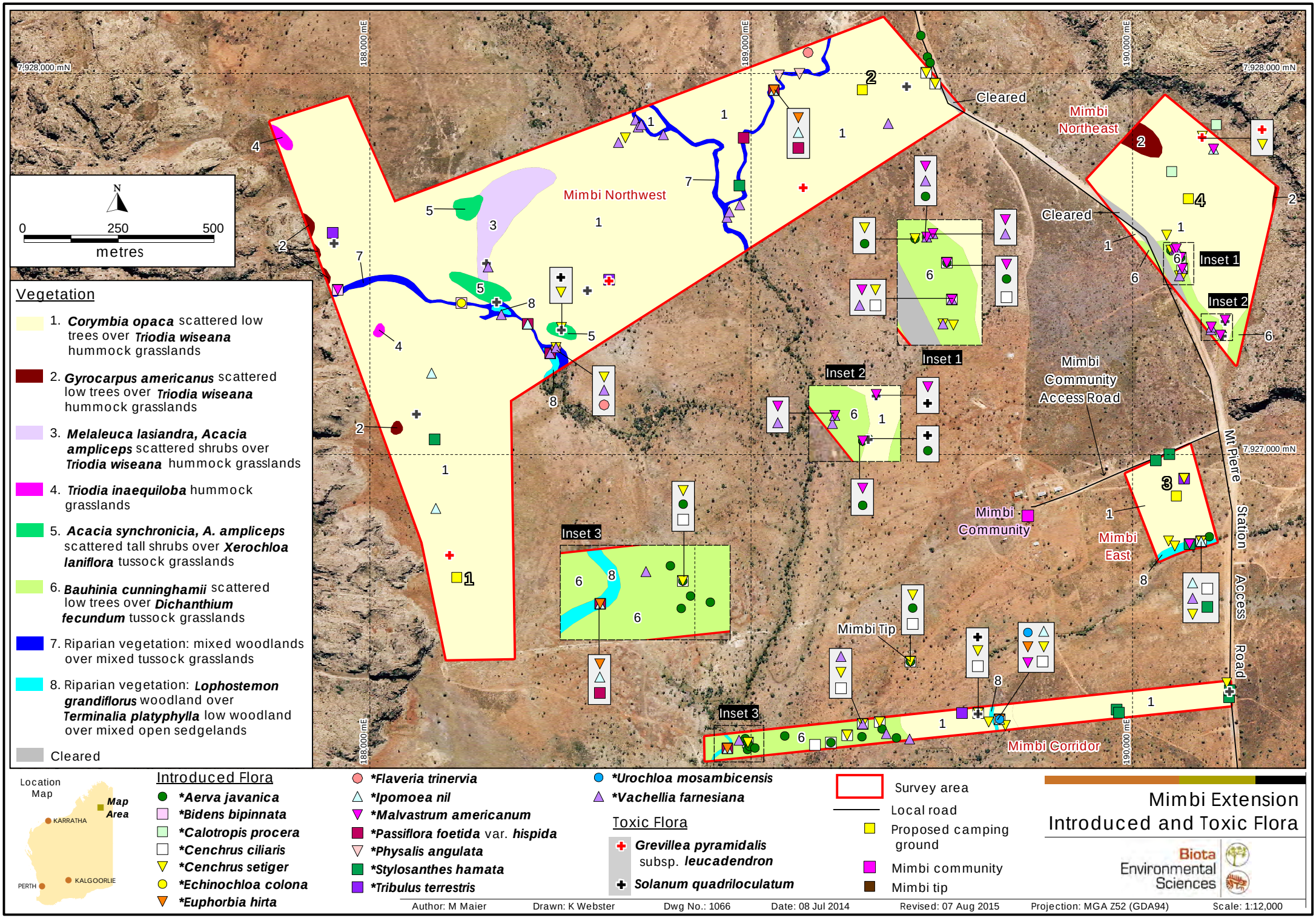
Mimbi Extension Survey Effort

Biota Environmental Sciences

Appendix 4

Key Features of the Study Area, Including Priority Flora, Weeds and Toxic Plants


7,928,000 mN
188,000 mE
189,000 mE
190,000 mE
7,927,000 mN
N
0
250
500
metres
Cleared
Mimbi Northeast
Mimbi Northwest
Cleared
Mimbi Community Access Road
Mt Pierre Station Access Road
Mimbi Community
Mimbi East
Inset
Mimbi Tip
Mimbi Corridor
Vegetation
1. Corymbia opaca scattered low trees over Triodia wiseana hummock grasslands
2. Gyrocarpus americanus scattered low trees over Triodia wiseana hummock grasslands
3. Melaleuca lasiandra, Acacia ampliceps scattered shrubs over Triodia wiseana hummock grasslands
4. Triodia inaequiloba hummock grasslands
5. Acacia synchronicia, A. ampliceps scattered tall shrubs over Xerochloa laniflora tussock grasslands
6. Bauhinia cunninghamii scattered low trees over Dichanthium fecundum tussock grasslands
7. Riparian vegetation: mixed woodlands over mixed tussock grasslands
8. Riparian vegetation: Lophostemon grandiflorus woodland over Terminalia platyphylla low woodland over mixed open sedgelands
Cleared
Location Map
Map Area
KARRATHA
PERTH
KALGOORLIE
Priority Flora
Triodia pascoeana (P1)
Ipomoea racemigera (P2)
Fimbristylis sieberiana (P3)
Pterocaulon xenicum (P3)
Possible New Species
Mitrasacme sp.
Unresolved Taxa
Eragrostis ? potamophila
Euphorbia ferdinandi
Euphorbia sp. (aff. fitzroyensis/wheeleri)
Senna ? sericea
Range Extensions
Eucalyptus argillacea
Fimbristylis elegans
Triumfetta albida
Survey area
Local road
Proposed camping ground
Mimbi community
Mimbi tip
Mimbi Extension
Conservation Significant Flora
Biota Environmental Sciences
Author: M Maier
Drawn: K Webster
Dwg No.: 1066
Date: 07 Jul 2014
Revised:
Projection: MGA Z52 (GDA94)
Scale: 1:12,000


7,928,000 mN
188,000 mE
189,000 mE
190,000 mE
7,927,000 mN
N
0
250
500
metres
Mimbi Northwest
Mimbi Northeast
Cleared
Inset 1
Inset 2
Inset 3
Mimbi Community Access Road
Mimbi Community
Mimbi East
Mimbi Tip
Mimbi Corridor
Mt Pierre Station Access Road
Vegetation
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Cleared
Location Map
Map Area
KARRATHA
KALGOORLIE
PERTH
Introduced Flora
*Aerva javanica
*Bidens bipinnata
*Calotropis procera
*Cenchrus ciliaris
*Cenchrus setiger
*Echinochloa colona
*Euphorbia hirta
*Flaveria trinervia
*Ipomoea nil
*Malvastrum americanum
*Passiflora foetida var. hispida
*Physalis angulata
*Stylosanthes hamata
*Tribulus terrestris
*Urochloa mosambicensis
*Vachellia farnesiana
Toxic Flora
Grevillea pyramidalis subsp. leucadendron
Solanum quadriloculatum
Survey area
Local road
Proposed camping ground
Mimbi community
Mimbi tip
Mimbi Extension
Introduced and Toxic Flora
Biota Environmental Sciences
Author: M Maier
Drawn: K Webster
Dwg No.: 1066
Date: 08 Jul 2014
Revised: 07 Aug 2015
Projection: MGA Z52 (GDA94)
Scale: 1:12,000

Priority flora species recorded from the study area

Species	Status	Area	Location	Easting	Northing	Density / No. of Plants	Specimen	Notes
Triodia pascoeana	Priority 1	Mimbi NW	MIMW-N102	189036	7927860	scattered in Pinnacle Creek	MW-67	Confirmed by M. Barrett.
Ipomoea racemigera	Priority 2	Mimbi E	MIMC-N172	190180	7926773	scattered in Mimbi Creek	MC-06	Confirmed by M. Barrett as closest to this taxon.
Fimbristylis sieberiana	Priority 3	Mimbi NW	MIMW-N201	188473	7927266	scattered at spring in Pinnacle Creek	MW-85	Confirmed by M. Barrett.
Pterocaulon xenicum	Priority 3	Mimbi E	MIMC-N188	190062	7926821	x 12 plants.		
			MIMC-N181	190069	7926987	x 1 plant.		
			MIMC-N182	190079	7926993	x 10 plants.		
			MIMC-N168	190149	7926885	x 1 plant.		
			MIMC-N184	190150	7926929	x 1 plant.		
			MIMC-N171	190164	7926830	x 24 plants		
			MIMC-N170	190169	7926832	x 2 plants.		
		Mimbi NE	MIME-N158	190159	7927587	x 3 plants.		
			MIME-N134	190231	7927313	x 10 plants.		
		Mimbi NW	MIMW-N79	187903	7927598	x 20 plants.		
			MIMW-N76	187907	7927558	x 9 plants.		
			MIMW-N77	187917	7927558	x 3 plants.		
			MIMW-N68	187976	7927363	x 1 plant.		
			MIMW-N84	188009	7927588	x 6 plants.		
			MIMW-N85	188064	7927496	x 3 plants.		
			MIMW-N86	188074	7927489	x 10 plants.		
			MIMW-N56	188207	7926567	x 1 plant.	MW-04	Sterile; confirmed by M. Barrett as almost certainly this species.
			MIMW-N234	188260	7927617	x 6 plants.		
			MIMW-N214	188260	7927643	x 3 plants.		
			MIMW-N213	188266	7927544	x 4 plants.		
			MIMW-N215	188300	7927672	x 20 plants.		
			MIMW-N216	188305	7927682	x 10 plants.		
			MIMW-N218	188325	7927703	x 5 plants.		
			MIMW-N229	188946	7927956	x 20 plants.		
			MIMW-N242	188959	7927927	x 15 plants.		
			MIMW-N108	189137	7927705	x 2 plants.		
			MIMW-N94	189146	7928014	x 1 plant.		
			MIMW-N120	189410	7928081	x 2 plants.		

Other flora of interest recorded from the study area

Species	Status	Area	Location	Easting	Northing	Density / No. of Plants	Specimen	Notes
Mitrasacme sp.	Potential new species	Mimbi NW	MIMW-N87	188093	7927452	1 plant.	MW-40	Determined by M. Barrett as "no match to any described species; probably a new species."
Eragrostis ? potamophila	Unresolved; range extension	Mimbi E	MIMC-N172	190180	7926773	5 plants.	MC-07	Described by Matt Barrett as "very small for *E. potamophila* but may be a dwarf form in semi-arid area".
Senna ? sericea	Unresolved; range extension	Mimbi NW	MIMW-N106	189002	7927657	1 plant.	MW-68	Range extension from south.
Triumfetta albida	Range extension	Mimbi NW	MIMW-N64	188075	7927072	scattered	MW-17	Round fruit; range extension from NW.
Euphorbia ferdinandi	Unresolved; range extension	Mimbi Corridor	MIMS-N19	189293	7926294	scattered	MC-73	S. Dillon: "seeds correct for *ferdinandi;* lacks gland appendages, so not var. *ferdinandi;* poor material, unsuitable to voucher".
Euphorbia sp. (aff. *fitzroyensis/wheeleri*)	Unresolved; range extension	Mimbi NW	MIMW-N64	188075	7927072	scattered	MW-22	S. Dillon: "characters intermediate between *E. wheeleri* and *E. fitzroyensis*; poor material, unsuitable to voucher".
		Mimbi NE	MIME-N125	190213	7927801	scattered		
		Mimbi E	MIMC-N165	190135	7926937	scattered		
Eucalyptus argillacea	Range extension	Mimbi Corridor	MIMS-N19	189315	7926293	1 tree.	MC-74	
Fimbristylis elegans	Poorly collected; first record for OVP bioregion	Mimbi NW	MIMW-N211	188240	7927398	scattered	MW-108	

Weed species recorded from the study area

Species	Area	Site	Easting	Northing	Cover	Specimen (this record) Notes
**Aerva javanica*	Mimbi Corridor	MIMS-N35	188984	7926255		x 1 plant.
		MIMS-N51	188991	7926227		x 1 plant.
		MIMS-N34	188992	7926245		x 3 plants.
		MIMS-N50	188997	7926235		x 5 plants.
		MIMS-N49	189010	7926231		x 2 plants.
		MIMS-N33	189088	7926262		x 2 plants.
		MIMS-N41	189209	7926245		x 3 plants.
		MIMS-N43	189290	7926260		x 6 plants.
		MIMS-N21	189343	7926280		x 15 plants.
		MIMS-N28	189381	7926257		x 30 plants.
	Mimbi E	MIMC-N187	190201	7926785		x 2 plants.
	Mimbi NE	MIME-N145	190101	7927536		x 1 plant.
		MIME-N144	190110	7927537		x 1 plant.
		MIME-N142	190126	7927517		x 1 plant.
		MIME-N134	190231	7927313		x 5 plants.
		MIME-N154	190236	7927315		x 2 plants.
**Aerva javanica*	Outside Mimbi NW (along Mt Pierre Stn road)	MIMW-N119	189445	7928099		x 50 plants from MIMW-N118 to here and more can be seen to the north.
		MIMW-N118	189462	7928043		x 7 plants
		MIMW-N117	189469	7928028		x 6 plants.
	Mimbi Tip	MIM-TIP	189418	7926457		
		MIM-TIP	189418	7926457		
**Bidens bipinnata*	Mimbi NW	MIMW-N69	187916	7927432		x 20 plants; specimen MW-26; Pinnacle Creek.
		MIMW-N211	188240	7927398		Pinnacle Creek.
**Calotropis procera*	Mimbi NE	MIME-N160	190103	7927742		x 1 plant.
	Outside Mimbi NE	MIME-N162	190220	7927865		x 1 plant, near bore.
**Cenchrus ciliaris*	Mimbi Corridor	MIMS-N34	188992	7926245	10%	
		MIMS-N40	189167	7926239		scattered only.
		MIMS-N41	189209	7926245		still scattered.
		MIMS-N31	189252	7926264	20%	
		MIMS-N19	189293	7926294	5%	dense along drain
		MIMS-N20	189337	7926299	30%	
		MIMS-N25	189596	7926322	20%	dense infestation around creek
		MIMS-N15	189651	7926306	10%	
	Mimbi E	MIMC-N172	190180	7926773	1%	
	Mimbi NE	MIME-N142	190126	7927517		occasional.
		MIME-N141	190130	7927488		scattered all through to here.
	Mimbi NW	MIMW-N123	189459	7928002		
		MIMW-N116	189483	7927973	10%	
	Mimbi Tip	MIM-TIP	189418	7926457		

Species	Area	Site	Easting	Northing	Cover	Specimen (this record) Notes
**Cenchrus setiger*	Mimbi Corridor	MIMS-N34	188992	7926245	20%	
		MIMS-N31	189252	7926264	30%	
		MIMS-N19	189293	7926294	10%	dense along drain
		MIMS-N20	189337	7926299	50%	
		MIMS-N25	189596	7926322	40%	dense infestation around creek
		MIMS-N46	189623	7926299	20%	
		MIMS-N15	189651	7926306	60%	
		MIMS-N14	189667	7926290	60%	dense infestation on bank of creek, extending along side gullies.
		MIMS-N06	190247	7926401		small patch; x 20 plants.
	Mimbi E	MIMC-N175	190095	7926774		x 1 plant.
		MIMC-N174	190111	7926760	30%	relatively dense patch on creek bank.
		MIMC-N165	190135	7926937		small patch; x 20 plants.
		MIMC-N172	190180	7926773	5%	
	Mimbi NE	MIME-N146	190090	7927576		dense around gate.
		MIME-N145	190101	7927536		scattered.
		MIME-N140	190123	7927469		patch; extending from road.
		MIME-N141	190130	7927488		scattered all through to here.
		MIME-N139	190131	7927468		x 6 plants.
		MIME-N150	190183	7927835		x 1 plant.
**Cenchrus setiger*	Mimbi NW	MIMW-N200	188488	7927281		x 5 plants.
		MIMW-N198	188503	7927334		x 32 plants at and north of 188525 mE, 7927311 mN
		MIMW-N225	188670	7927831		x 5 plants.
		MIMW-N123	189459	7928002		
		MIMW-N116	189483	7927973	50%	
	Mimbi Tip	MIM-TIP	189418	7926457		
**Echinochloa colona*	Mimbi NW	MIMW-N211	188240	7927398		Specimen MW-97; Pinnacle Creek.
**Euphorbia hirta*	Mimbi Corridor	MIMS-N37	188938	7926230		Pinnacle Creek.
		MIMS-N15	189651	7926306		Scattered in Mimbi Creek.
	Mimbi NW	MIMW-N100	189060	7927956		Pinnacle Creek.
**Flaveria trinervia*	Mimbi NW	MIMW-N93	189149	7928055		x 20 plants
		MIMW-N200	188488	7927281		scattered.
**Ipomoea nil*	Mimbi Corridor	MIMS-N37	188938	7926230		
		MIMS-N15	189651	7926306		Specimen MC-58.
	Mimbi E	MIMC-N172	190180	7926773		occasional.
	Mimbi NE	MIME-N125	190213	7927801		
	Mimbi NW	MIMW-N90	188162	7927214		x 1 plant on *Ficus aculeata.*
		MIMW-N62	188173	7926859		x 1 plant, growing in a *Carissa* shrub.
		MIMW-N207	188414	7927343		
		MIMW-N100	189060	7927956		

Species	Area	Site	Easting	Northing	Cover	Specimen (this record) Notes
**Malvastrum americanum*	Mimbi Corridor	MIMS-N15	189651	7926306		x 1 plant; specimen MC-49; Mimbi Creek.
	Mimbi E	MIMC-N173	190150	7926765		x 1 plant; Mimbi Creek.
	Mimbi NE	MIME-N144	190110	7927537		scattered.
		MIME-N143	190115	7927540		x 5 plants.
		MIME-N142	190126	7927517		still common.
		MIME-N141	190130	7927488		dense patch.
		MIME-N137	190207	7927335		x 10 plants.
		MIME-N125	190213	7927801		occasional.
		MIME-N134	190231	7927313		x 20 plants.
		MIME-N153	190243	7927353		
	Mimbi NW	MIMW-N69	187916	7927432		x 10 plants; tributary of Pinnacle Creek.
**Passiflora foetida* var. *hispida*	Mimbi Corridor	MIMS-N37	188938	7926230		
	Mimbi NW	MIMW-N207	188414	7927343		
		MIMW-N201	188473	7927266		occasional.
		MIMW-N103	188980	7927831		
		MIMW-N100	189060	7927956		
**Physalis angulata*	Mimbi NW	MIMW-N97	189073	7927995		
		MIMW-N95	189127	7927999		Specimen MW-62.
**Stylosanthes hamata*	Mimbi Corridor	MIMS-N01	189958	7926331		scattered along track edge.
		MIMS-N09	189965	7926323		scattered on verge.
		MIMS-N04	190253	7926364		very scattered along road verge; specimen MC-25.
		MIMS-N05	190255	7926382		x 3 plants
	Mimbi E	MIMC-N180	190061	7926985		scattered on verge.
		MIMC-N183	190097	7927001		scattered on road verge.
		MIMC-N173	190150	7926765		x 2 plants.
		MIMC-N172	190180	7926773		x 3 plants; scattered through bed of Mimbi Creek; specimen MC-09.
	Mimbi NW	MIMW-N72	188170	7927040		x 5 plants in spinifex.
		MIMW-N110	188969	7927706		by a Corymbia opaca tree.
**Tribulus terrestris*	Mimbi Corridor	MIMS-N24	189553	7926322		Specimen MC-76.
	Mimbi E	MIMC-N165	190135	7926937		Specimen MC-02.
	Mimbi NW	MIMW-N78	187903	7927582		Specimen MW-36.
		MIMW-N205	188628	7927459		occasional.
**Urochloa mosambicensis*	Mimbi Corridor	MIMS-N15	189651	7926306		Specimen MC-51; confirmed by M. Barrett.
**Vachellia farnesiana*	Mimbi Corridor	MIMS-N36	188968	7926251		x 1 plant.
		MIMS-N19	189293	7926294		
		MIMS-N29	189355	7926268		Specimen MC-85.
		MIMS-N47	189416	7926254	1%	
	Mimbi E	MIMC-N172	190180	7926773		x 1 plant; Mimbi Creek.
	Mimbi NE	MIME-N144	190110	7927537		x 1 plant.
		MIME-N143	190115	7927540		x 2 plants.
		MIME-N140	190123	7927469		x 7 plants.
		MIME-N141	190130	7927488		scattered all through to here.
		MIME-N136	190205	7927328		x 2 plants.
		MIME-N137	190207	7927335		x 1 plant.

Species	Area	Site	Easting	Northing	Cover	Specimen (this record) Notes
**Vachellia farnesiana*	Mimbi NW	MIMW-N232	188310	7927492		occasional.
		MIMW-N209	188345	7927367		x 1 plant.
		MIMW-N201	188473	7927266		1 plant.
		MIMW-N200	188488	7927281		x 1 plant.
		MIMW-N224	188652	7927819		occasional.
		MIMW-N227	188697	7927878		x 1 plant.
		MIMW-N226	188704	7927859		x 1 plant.
		MIMW-N228	188712	7927865		x 1 plant.
		MIMW-N239	188770	7927839		
		MIMW-N190	188937	7927622		occasional.
		MIMW-N105	188943	7927637		x 1 shrub.
		MIMW-N104	188970	7927655		x 2 shrubs.
		MIMW-N115	189360	7927868	1%	x 8 tall shrubs.

Toxic species recorded from the study area

NB. See also **Calotropis procera* and **Passiflora foetida* var. *hispida*.

Species	Area	Location	Easting	Northing	Notes
Grevillea pyramidalis subsp. *leucadendron*	Mimbi NE	MIME-N150	190183	7927835	
	Mimbi NW	MIMW-N73	188210	7926740	Specimen MW-47, confirmed by M. Barrett; occasional.
		MIMW-N205	188628	7927459	occasional.
		MIMW-N108	189137	7927705	
Solanum quadriloculatum	Mimbi Corridor	MIMS-N25	189596	7926322	Specimen MC-77.
		MIMS-N05	190255	7926382	Specimen MC-26; one patch near road.
	Mimbi NE	MIME-N154	190236	7927315	
		MIME-N153	190243	7927353	
	Mimbi NW	MIMW-N76	187907	7927558	6082.jpg.
		MIMW-N71	188122	7927111	Specimen MW-46.
		MIMW-N233	188306	7927508	occasional.
		MIMW-N210	188333	7927407	
		MIMW-N198	188503	7927334	
		MIMW-N206	188571	7927437	
		MIMW-N122	189407	7927974	

Appendix 5

List of Vascular Flora Recorded from the Study Area

Family	Species	Notes
Acanthaceae		
	Dicliptera armata	
Aizoaceae		
	Trianthema pilosum	
	Trianthema triquetrum	
Amaranthaceae		
	**Aerva javanica*	Weed
	Alternanthera angustifolia	
	Gomphrena canescens subsp. *canescens*	
	Ptilotus calostachyus	
	Ptilotus capitatus	
	Ptilotus corymbosus	
	Ptilotus gardneri	
	Ptilotus nobilis subsp. *nobilis*	
Apocynaceae		
	**Calotropis procera*	Weed (declared pest); toxic sap
	Carissa lanceolata	Bush food
	Cynanchum puberulum	
	Marsdenia angustata	
Asteraceae		
	**Bidens bipinnata*	Weed
	Blumea tenella	
	**Flaveria trinervia*	Weed
	Pluchea tetranthera	
	Pterocaulon serrulatum var. *velutinum*	
	Pterocaulon sphacelatum	
	Pterocaulon xenicum	Priority 3
	Streptoglossa bubakii	
	Streptoglossa decurrens	
Bignoniaceae		
	Dolichandrone heterophylla	
Bixaceae		
	Cochlospermum fraseri	Bush food
Boraginaceae		
	Ehretia saligna	
	Heliotropium cunninghamii	
	Heliotropium tanythrix	
	Trichodesma zeylanicum var. *zeylanicum*	
Campanulaceae		
	Lobelia arnhemiaca	
Cannabaceae		
	Celtis philippensis	Bush food
Capparaceae		
	Capparis lasiantha	Bush food
	Capparis umbonata	Bush food
Caryophyllaceae		
	Polycarpaea longiflora	
Celastraceae		
	Stackhousia intermedia	
Chenopodiaceae		
	Dysphania sphaerosperma	
	Salsola australis	
Cleomaceae		
	Cleome viscosa	

Family	Species	Notes
Combretaceae		
	Terminalia carpentariae	Bush food
	Terminalia platyphylla	
Convolvulaceae		
	Evolvulus alsinoides var. *villosicalyx*	
	Ipomoea coptica	
	Ipomoea costata	Bush food
	Ipomoea eriocarpa	
	**Ipomoea nil*	Weed
	Ipomoea racemigera	Priority 2
	Operculina aequisepala	
	Polymeria lanata	
Cucurbitaceae		
	Cucumis althaeoides	
	Cucumis melo	
	Trichosanthes cucumerina var. *cucumerina*	
Cyperaceae		
	Cyperus difformis	
	Cyperus squarrosus	
	Cyperus vaginatus	
	Fimbristylis cephalophora	
	Fimbristylis dichotoma	
	Fimbristylis elegans	
	Fimbristylis sieberiana	Priority 3
	Schoenus falcatus	
Euphorbiaceae		
	Euphorbia australis var. *subtomentosa*	
	Euphorbia biconvexa	
	Euphorbia ferdinandi	
	**Euphorbia hirta*	Weed
	Euphorbia tannensis subsp. *eremophila*	
	Euphorbia trigonosperma	
	Euphorbia sp. (aff. *fitzroyensis/wheeleri*)	
Fabaceae		
	Acacia ampliceps	Bush food
	Acacia bivenosa	
	Acacia colei var. colei	Bush food
	Acacia inaequilatera	
	Acacia synchronicia	
	Alysicarpus muelleri	
	Bauhinia cunninghamii	Bush food
	Cajanus marmoratus	
	Crotalaria medicaginea var. *neglecta*	
	Crotalaria montana var. *angustifolia*	
	Cullen badocanum	
	Cullen pustulatum	
	Desmodium filiforme	
	Indigastrum parviflorum	
	Indigofera colutea	
	Indigofera linifolia	
	Indigofera linnaei	
	Indigofera trita subsp. *trita*	
	Neptunia dimorphantha	
	Rhynchosia minima	
	Senna artemisioides subsp. *oligophylla*	
	Senna artemisioides subsp. *oligophylla* x	
	Senna glutinosa subsp. *glutinosa*	

Family	Species	Notes
Fabaceae (cont.)	*Senna magnifolia*	
	Senna notabilis	
	Senna oligoclada hybrid	
	Senna ? sericea	
	Senna symonii	
	Senna venusta	
	Sesbania cannabina	
	**Stylosanthes hamata*	Weed
	Tephrosia supina	
	Tephrosia sp. Northern (K.F. Kenneally 11950)	
	**Vachellia farnesiana*	Weed
	Vigna lanceolata	Bush food
Goodeniaceae		
	Goodenia armitiana	
	Goodenia sepalosa var. *sepalosa*	
	Goodenia triodiophila	
	Scaevola amblyanthera	
Gyrostemonaceae		
	Codonocarpus cotinifolius	
Hernandiaceae		
	Gyrocarpus americanus subsp. *pachyphyllus*	
Lamiaceae		
	Clerodendrum floribundum var. *coriaceum*	
	Premna acuminata	
Lauraceae		
	Cassytha capillaris	
	Cassytha filiformis	Bush food
Loganiaceae		
	Mitrasacme sp.	
Loranthaceae		
	Amyema sanguinea var. *sanguinea*	Bush food
Lythraceae		
	Ammannia multiflora	
Malvaceae		
	Abutilon hannii	
	Corchorus sidoides subsp. *sidoides*	
	Corchorus tridens	
	Gossypium australe	
	Hibiscus leptocladus	
	Hibiscus pentaphyllus	
	**Malvastrum americanum*	Weed
	Melhania oblongifolia	
	Sida fibulifera	
	Triumfetta albida	
	Triumfetta incana	
Marsileaceae		
	Marsilea hirsuta	
Menispermaceae		
	Tinospora smilacina	
Moraceae		
	Ficus aculeata var. *indecora*	Bush food
Myrtaceae		
	Corymbia bella	
	Corymbia opaca	Bush food
	Eucalyptus argillacea	
	Eucalyptus camaldulensis	
	Eucalyptus pruinosa subsp. *pruinosa*	

Family	Species	Notes
Myrtaceae (cont.)	*Eucalyptus tectifica*	
	Lophostemon grandiflorus subsp. *riparius*	
	Melaleuca lasiandra	
Nyctaginaceae		
	Boerhavia coccinea	
	Boerhavia gardneri	
	Boerhavia paludosa	
Oleaceae		
	Jasminum didymum	
Onagraceae		
	Ludwigia octovalvis	
	Ludwigia perennis	
Orobanchaceae		
	Buchnera asperata	
	Buchnera linearis	
Passifloraceae		
	**Passiflora foetida* var. *hispida*	Weed; bush food, but also potentially toxic fruit; irritant hairs
Pedaliaceae		
	Josephinia eugeniae	
Phrymaceae		
	Mimulus uvedaliae var. *uvedaliae*	
Phyllanthaceae		
	Flueggea virosa subsp. *melanthesoides*	Bush food
	Notoleptopus decaisnei	
	Phyllanthus maderaspatensis	
Plantaginaceae		
	Stemodia viscosa	
	Stemodia sp. (immature material)	
Poaceae		
	Aristida contorta	
	Aristida holathera var. *holathera*	
	Aristida hygrometrica	
	Aristida latifolia	
	Aristida pruinosa	
	Brachyachne convergens	
	**Cenchrus ciliaris*	Weed
	**Cenchrus setiger*	Weed
	Chrysopogon pallidus	
	Cymbopogon obtectus	
	Dactyloctenium radulans	
	Dichanthium fecundum	
	Dichanthium sericeum subsp. *polystachyum*	
	Digitaria ctenantha	
	**Echinochloa colona*	Weed
	Enneapogon lindleyanus	
	Enneapogon polyphyllus	
	Enneapogon purpurascens	
	Eragrostis cumingii	
	Eragrostis desertorum	
	Eragrostis exigua	
	Eragrostis ? potamophila	
	Eragrostis setifolia	
	Eragrostis tenellula	
	Eragrostis xerophila	
	Eriachne obtusa	

Family	Species	Notes
Poaceae (cont.)	*Heteropogon contortus*	
	Iseilema vaginiflorum	
	Mnesithea formosa	
	Panicum decompositum	
	Panicum laevinode	
	Paraneurachne muelleri	
	Sehima nervosum	
	Setaria surgens	
	Sorghum stipoideum	
	Sporobolus actinocladus	
	Sporobolus australasicus	
	Themeda avenacea	
	Triodia inaequiloba	
	Triodia pascoeana	Priority 1
	Triodia wiseana (Fitzroy Crossing form)	
	Tripogon loliiformis	
	**Urochloa mosambicensis*	Weed
	Urochloa piligera	
	Urochloa subquadripara	
	Xerochloa laniflora	
	Yakirra australiensis var. *australiensis*	
Polygalaceae		
	Polygala pterocarpa	
Portulacaceae		
	Portulaca filifolia	
Proteaceae		
	Grevillea pyramidalis subsp. *leucadendron*	
	Grevillea striata	Caustic fruit
	Hakea arborescens	Bush food
Rhamnaceae		
	Ventilago viminalis	
Rubiaceae		
	Oldenlandia crouchiana	
	Oldenlandia galioides	
	Spermacoce dolichosperma	
	Spermacoce laevigata	
Santalaceae		
	Santalum lanceolatum	Bush food
Sapindaceae		
	Atalaya hemiglauca	
	Dodonaea lanceolata var. *lanceolata*	
Scrophulariaceae		
	Eremophila longifolia	
Solanaceae		
	**Physalis angulata*	Weed; bush food
	Solanum quadriloculatum	Poisonous fruit
Typhaceae		
	Typha domingensis	Bush food
Violaceae		
	Hybanthus aurantiacus	
Zygophyllaceae		
	Tribulopis angustifolia	
	Tribulopis bicolor	
	**Tribulus terrestris*	Weed